Project Manual

for

2022 BOND
NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT
Pasadena Independent School District

February 18, 2025
Issue for Bid

Texas Arcadis Project No.: **202301**

PISD CSP No.: **25P-034LP**

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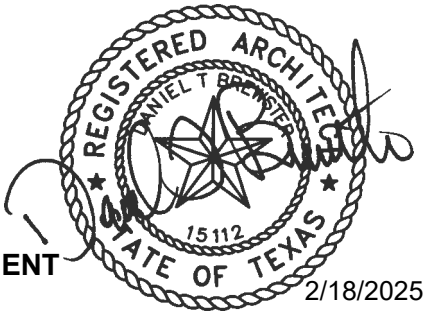

2/18/2025

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PASADENA INDEPENDENT SCHOOL DISTRICT

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SUBCONTRACTOR / MANUFACTURER PREQUALIFICATION

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 GENERAL

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. The Contract Documents – Drawings and Specifications – are produced and based on specific manufacturer's materials and assemblies; including proper interface with adjacent materials and assemblies. The 'basis of design' manufacturer and product is identified in each Section of Specifications or as noted on the Drawings.
   01 Unless specifically defined as 'proprietary' or 'no substitutions', other acceptable manufacturers are listed in the Specification Section.
   02 These manufacturers have previously demonstrated a superior level of product and service and are therefore listed as 'Acceptable' Manufacturers.

C. In addition to a specific manufacturer's material / product used as the Basis of Design, certain Sections of the Specifications list Acceptable Subcontractors. These Sub-contractors have previously demonstrated a superior level of workmanship, capability and service.

D. It is not the intent to limit competition or exclude other qualified manufacturers or sub-contractors from proposing on the Work; however, those requesting to be added to an 'acceptable' list are required to provide documentation for evaluation by the Architect or Consultant prior to submitting a bid / proposal to a General Contractor.

PART 2 - MANUFACTURERS

2.1 ACCEPTABLE MANUFACTURER LISTINGS

A. The materials, products and equipment described in the Proposal Documents establish a standard of required function, properties, dimension, appearance and quality to be met by any proposed substitution.
   01 The manufacturer, products and equipment named as the Basis of Design, and the procedures covered by these Specifications have been selected as a standard because of quality, particular suitability or record of satisfactory performance.

B. In Sections where a particular manufacturer's product is used as the "Basis for Design", that product and other specified descriptions shall establish the minimum requirements, performance criteria and attributes necessary to meet the Contract Document requirements.
   01 Where manufacturer and or product are specified as "no substitutions", only the specified manufacturer and product shall be acceptable to include in a Proposal.

C. In Sections that have additional acceptable manufacturers listed, those manufacturers have been included based on historical data of providing quality products and assemblies.

D. It is entirely incumbent on the other listed acceptable manufacturers to propose on and provide products, materials, equipment and / or assembly(s) which fully meet or exceed the 'Basis of Design' product, attributes, performance and all other specified requirements.

01 By submitting a proposal / bid to a General Contractor, a listed acceptable manufacturer is affirming that their proposal / bid meets or exceeds the 'Basis of Design' material / product / assembly and all specified requirements.

E. The lists are not all inclusive nor is there any warranty, express or implied, on the part of the Owner, Architect or his Consultants that the Subcontractors and / or manufacturers listed shall perform satisfactorily on this Project, nor that they are financially sound at the present time. Since it is required that the Contractor shall have the Contractor-Subcontractor relationship required by the Contract Documents with his Subcontractors, it is imperative that he be satisfied with the ability and financial strength of the listed Subcontractors.

2.2 PROCEDURES DURING BIDDING / PROPOSAL PERIOD

A. The acceptable manufacturers lists are not all inclusive; and such lists are not intended to restrict competition or exclude otherwise qualified manufacturers from submitting bids. Accordingly, Proposers may submit for consideration the names and qualifications of other manufacturers / providers which they feel are qualified by following the procedure enumerated below.

B. Each manufacturer / provider requesting to be added to the acceptable list of manufacturers included in individual Specification Sections must submit the following qualification information a minimum of ten (10) days prior to the proposal date.

01 Submit information to the Architect and relative A/E Consultant as applicable.
02 Submissions shall be accepted only in electronically in PDF format.
03 Faxed or telephonic submissions shall not be accepted.

C. For a manufacturer's product to be considered for acceptance, the following material must be submitted to the Architect or relative Consultant, as applicable, not later than ten (10) calendar days prior to the date set for the receipt of proposals from General Contractors:

01 Name of manufacturer, contact person, phone number and email address.
02 Provide the Specification Section number(s) and the specific specified product for which the substitution request is being made.
03 Submit a copy of the printed project Specification Section with each and every paragraph and statement initialed by the submitter that their proposed product shall meet or exceed the specified properties, attributes and / or performance criteria. Where proposed products may deviate from the Specification, clearly indicate so; and submit / describe in detail what alternatively is proposed to be accepted.
04 Provide complete and specific product data for the proposed product, including but not limited to like information, performance criteria, test results, etc. established for the "Basis of Design" product and accompanying Specifications. Submission of general documentation that does not specifically identify only the proposed substitution shall not be accepted.
05 If the proposed product alters an assembly, detail or interface with adjacent materials as described in the Contract Documents, provide graphic illustration of the revised assembly, detail or interface with adjacent materials. Submission of general or generic documentation / details that do not specifically relate to this project shall not be accepted.

06 Other supporting documentation the submitter wants to be included in the evaluation process.

D. Submissions which fail to clearly delineate the specific information to be considered shall not be considered for acceptance; nor will the submitter be notified to correct the deficiency of the submitted material.

E. A submitted product found to be acceptable for use in this Project shall be included by Addendum. No other form of approval shall allow the product to be substituted.

F. Proposers shall include in their proposal only manufacturers that are listed as the Basis of Design or listed as an acceptable manufacturer in the Specifications, or subsequently included in an Addendum as being acceptable.

PART 3 - SUBCONTRACTORS

3.1 ACCEPTABLE SUBCONTRACTOR LISTINGS

A. Certain Sections of the Specifications may list Acceptable Subcontractors. For the Work included in those Sections, Proposals must include one of the Sub-Contractors listed. Where a Specification Section does not include a list of Acceptable Subcontractors, the General Contractor / Proposer is free to utilize any Subcontractor that the General Contractor feels is an acceptable Subcontractor.

B. The Subcontractors listed as acceptable have been selected because of a demonstrated ability to acceptably perform the Work required for a project of this type and size within the allowable time anticipated for construction. It is not intended to preclude the use of other equally or better qualified Subcontractors provided that same meet the requirements of this particular project.

C. The lists are not all inclusive nor is there any warranty, express or implied, on the part of the Owner, Architect or his Consultants that the Subcontractors and / or manufacturers listed shall perform satisfactorily on this Project nor that are they financially sound at the present time. Since it is required that the Contractor shall have the Contractor-Subcontractor relationship required by the Contract Documents with his Subcontractors, it is imperative that he be satisfied with the ability and financial strength of the listed Subcontractors.

3.2 PROCEDURES DURING BIDDING / PROPOSAL PERIOD

A. Any Proposer desiring to have a Subcontractor included in the list of Acceptable Subcontractors shall have the Subcontractor submit qualification information to the Architect or pertinent Consultant as applicable for evaluation to be accepted to provide work on this project.

B. Each manufacturer requesting to be added to the acceptable list of manufacturers included in individual Specification Sections must submit the following qualification information a minimum of ten (10) days prior to the proposal date.
   01 Submit information to the Architect and relative A/E Consultant as applicable.
   02 Submissions shall be accepted only in hard copy or electronically in PDF format.
   03 Faxed or telephonic submissions shall not be accepted.

C. For a proposed Subcontractor to be considered for acceptance the following material must be submitted to the Architect or relative Consultant, as applicable, not later than ten (10) calendar days prior to the date and time set for the receipt of proposals from general contractors:

01 Name of Subcontractor, contact person, phone number and email address.

02 Provide the Specification Section number(s) and the specific trade(s) for which the substitution request is made for.

03 Submit a copy of the printed project Specification Section with each and every paragraph and statement initialed by the submitter that their proposed product shall meet or exceed the specified properties, attributes and / or performance criteria. Where proposed products may deviate from the Specification, clearly indicate so; and submit / describe in detail what alternatively is proposed to be accepted.

04 Provide a completed Qualification Statement (AIA Document A305).

05 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. Submitted information for each project shall include the following information:

a. Project name and location.

b. General Contractor's project manager name and contact information (current phone number and email address)

c. Architect's project manager name and contact information (current phone no. and email address).

06 A list of at least three (3) references of General Contractors and three (3) Architects which the proposer has completed work for in the last five (5) years including contact information (current phone number and email address).

07 Other supporting information the proposed Subcontractor wants to be considered in the evaluation process.

D. A Subcontractor found to be acceptable for use on this project shall be included by Addendum. No other form of approval shall allow the Subcontractor to be substituted.

E. Proposers shall include in their proposal only Subcontractors that are listed as acceptable in the Specifications, or subsequently included in an Addendum as being acceptable.

END OF SECTION

DOCUMENT 00 11 19

REQUEST FOR COMPETITIVE SEALED PROPOSALS

Competitive sealed proposals must be submitted online in the Pasadena ISD eBid System for the project indicated below:

Project: 2022 Bond – New Williams Elementary School Replacement (CSP #25P-034LP)

Owner: Pasadena Independent School District

Project Budget: $33,625,000.00

Proposal Date: April 1, 2025

Proposal Time: 2:00PM (Base Bid)

Proposal Time: 3:00PM (Alternates)

Proposal Location: Pasadena Independent School District
Administration Building
3920 Mickey Gilley Blvd.
Pasadena, Texas 77505

Vendors may login to view drawings and specifications and submit their response at the following link: https://pasadenaisd.ionwave.net.

Each prime Offeror may obtain from the reproduction company two (2) sets of Bidding Documents for a deposit of $250.00 per set. Checks are to be made payable to Pasadena ISD – CSP #25P-034LP.

Partial and complete sets may be purchased for actual reproduction cost (with prior permission of the Architect) from the reproduction company:

Triangle Reproductions, Inc.
8168 Westpark Dr.
Houston, Texas 77063
info@triangletexas.com

No proposal shall be withdrawn for a period of sixty (60) days after the opening of the proposals without the consent of the Owner.

Each Offeror must submit the following items to Pasadena ISD, no later than 4:00PM, Friday, March 18, 2025 online in the Pasadena ISD eBid System.

1. A properly executed and current Contractor's Qualification Statement, AIA Document A305, including contractor's references and history of work.
2. A résumé for the Offeror's proposed Project Manager, stating his/her qualifications and experience on projects of similar scope and size
3. A résumé for the Offeror's proposed Project Superintendent, stating his/her qualifications and experience on projects of similar scope and size

Each Offeror must submit their proposal for the work included in the Base Bid on the Proposal Form (Document 00 42 13) bound herein at the Proposal Location indicated above and not later than the Proposal Time (Base Bid) and Proposal Date indicated above.

The documents listed below must accompany the proposals for the work included in the Base Bid. Each document, including the Proposal Form, but excluding the certified check or Bid Bond, must be submitted online in the Pasadena ISD eBid System.

1. A certified check, payable to the Owner, or an acceptable Bid Bond (Document 00 43 13, Bid Security Form), in an amount not less than 10% of the greatest amount bid.
2. A fully executed Felony Conviction Notification form (Document 00 45 18)
3. A fully executed Affidavit of Non-Collusion (Document 00 45 19)
4. A fully executed Proposal Evaluation Waiver (Document 00 45 21)
5. A fully executed Conflict of Interest Questionnaire (Document 00 45 22)
6. A fully executed Certificate of Interested Parties (Form 1295) (Document 00 45 23)
7. A fully executed Certificate of Non-Segregated Facilities (Document 00 45 33)
8. A fully executed Equal Opportunity Employer Statement (Document 00 45 35)
9. A fully executed Equal Opportunity Employer Affidavit (Document 00 45 36)
10. A fully executed Certification Regarding Terrorist Organizations & Boycott of Israel (Document 00 52 10)
11. A fully executed Indemnity and Hold Harmless Agreement (Document 00 61 16)
12. A fully executed SB9 Contractor Certification (Document 00 62 08)
13. A fully executed Certification of Criminal History Record – Contractor (Document 00 62 09.01)
14. A fully executed Certification of Criminal History Record – Subcontractor (Document 00 62 09.02)
15. A fully executed Debarment Form (Document 00 62 00)

The sealed proposals will be publicly opened immediately following the time at which the Base Bid proposals are due and the names of the offerors and the monetary proposals will be read aloud.

A Performance Bond and a Payment Bond, each in an amount not less than 100% of the Contract Sum, conditioned upon the faithful performance of the Contract, will be required. Bonding companies must meet specified requirements acceptable to the Owner (Refer to Document 00 61 13.13 and Document 00 61 13.16 of the Project Manual).

A pre-bid conference will be held at 1:30PM on March 4, 2025 at the offices of the Pasadena Independent School District Facilities and Construction Department, which are located at 1814 East Sam Houston Parkway South, Pasadena, Texas, 77503.

A representative from the Architect's office will be present to address questions.

All questions concerning the Proposal shall be directed to the offices of Texas Arcadis Inc.

END OF DOCUMENT 00 11 19

AIA® Document A701® – 2018

Instructions to Bidders

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

Williams Elementary School Replacement
1522 Scarborough Lane
Pasadena, Texas 77502

THE OWNER:
(Name, legal status, address, and other information)

Pasadena Independent School District
1515 Cherrybrook Lane
Pasadena, Texas 77502
(713) 740-4015

THE ARCHITECT:
(Name, legal status, address, and other information)

Texas-IBI Group, Inc.
P. O. Box 891209
Houston, Texas 77289
(281) 286-6605

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- **.1** the Bidder has read and understands the Bidding Documents;
- **.2** the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- **.3** the Bid complies with the Bidding Documents;
- **.4** the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- **.5** the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- **.6** the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 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.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

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

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:
(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:
(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids
Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)
§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability
A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals
§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

.1 a designation of the Work to be performed with the Bidder's own forces;
.2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; 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.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder 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 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds
§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

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

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS
§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Additions and Deletions Report for

AIA® Document A701® – 2018

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 12:27:55 ET on 02/15/2023.

PAGE 1

Williams Elementary School Replacement
1522 Scarborough Lane
Pasadena, Texas 77502

...

Pasadena Independent School District
1515 Cherrybrook Lane
Pasadena, Texas 77502
(713) 740-4015

...

Texas-IBI Group, Inc.
P. O. Box 891209
Houston, Texas 77289
(281) 286-6605

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 12:27:55 ET on 02/15/2023 under Order No. 2114290520 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

DOCUMENT 00 22 13

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

The following supplements contain changes and additions to Document 00 21 13, Instructions to Bidders (AIA Document A701 – 2018). The portions of the Instructions to Bidders not modified, supplemented, or deleted by these Supplementary Instructions to Bidders shall remain in effect. As appropriate, for purposes of this Request for Competitive Sealed Proposals, the term "Bid" shall mean "Proposal" and the term "Bidder" shall mean "Offeror", wherever they appear in the Contract Documents.

ARTICLE 2 -- BIDDER'S REPRESENTATIONS

*Add subparagraph **2.1.5** as follows:*

2.1.5 If applicable - The existing facility will be open to allow general contractors, subcontractors, and other interested parties to examine the existing conditions at the dates and times indicated in Document 00 11 19, Request for Competitive Sealed Proposals. A representative from the Architect's office will be present to address questions.

ARTICLE 3 -- BIDDING DOCUMENTS

3.3 SUBSTITUTIONS

*Add subparagraph **3.3.5** as follows:*

3.3.5 Refer to Section 01 25 00, Product Substitution Procedures, for substitution procedures.

3.4 ADDENDA

*Delete subparagraph **3.4.3** in its entirety.*

ARTICLE 4 -- BIDDING PROCEDURES

4.2 BID SECURITY

*Delete subparagraph **4.2.2** in its entirety and replace it with the following:*

4.2.2 A bid security is required and it shall be written on Document 00 43 13, Bid Security Form, which is bound into the Project Manual. 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.

4.4 MODIFICATION OR WITHDRAWAL OF BID

*At subparagraph **4.4.1**, change the phrase* "stipulated time" *to read* "sixty day".

*Add paragraphs **4.5** and **4.6** as follows:*

4.5 DOCUMENTS TO BE SUBMITTED PRIOR TO BID

4.5.1 Each Offeror must submit the following items no later than the date and time indicated in Document 00 11 19, Request for Competitive Sealed Proposals:

- **.1** A properly executed and current Contractor's Qualification Statement, AIA Document A305.
- **.2** A resume for the Offeror's proposed Project Manager, stating their qualifications and experience on projects of similar scope and size.
- **.3** A resume for the Offeror's proposed Project Superintendent, stating their qualifications and experience on projects of similar scope and size.

4.6 OTHER DOCUMENTS TO BE SUBMITTED WITH BID

4.6.1 A fully executed Felony Conviction Notification form (Refer to Document 00 45 18 of the Project Manual).

4.6.2 A fully executed Affidavit of Non-Collusion (Refer to Document 00 45 19 of the Project Manual).

4.6.3 A fully executed Proposal Evaluation Waiver (Refer to Document 00 45 21 of the Project Manual).

4.6.4 A fully executed Conflict of Interest Questionnaire (Refer to Document 00 45 22 of the Project Manual).

4.6.5 A fully executed Certificate of Interested Parties (Form 1295) (Refer to Document 00 45 23 of the Project Manual).

4.6.6 A fully executed Certificate of Non-Segregated Facilities (Refer to Document 00 45 33 of the Project Manual).

4.6.7 A fully executed Equal Opportunity Employer Statement (Refer to Document 00 45 35 of the Project Manual).

4.6.8 A fully executed Equal Opportunity Employer Affidavit (Refer to Document 00 45 36 of the Project Manual).

4.6.9 A fully executed Certification Regarding Terrorist Organizations & Boycott of Israel (Document 00 52 10 of the Project Manual).

4.6.10 A fully executed Indemnity and Hold Harmless Agreement (Document 00 61 16 of the Project Manual)>

4.6.11 A fully executed SB9 Contractor Certification (Document 00 62 08 of the Project Manual).

4.6.12 A fully executed Certification of Criminal History Record – Contractor (Document 00 62 09.01 of the Project Manual).

4.6.13 A fully executed Certification of Criminal History Record – Subcontractor (Document 00 62 09.02 of the Project Manual).

4.6.14 A fully executed Debarment Form (Document 00 62 00 of the Project Manual).

ARTICLE 5 -- CONSIDERATION OF BIDS

5.3 ACCEPTANCE OF BID (AWARD)

*Delete subparagraph **5.3.1** in its entirety and replace it with the following:*

5.3.1 It is the Owner's intention to award a contract using the Competitive Sealed Proposal process (CSP), as authorized by the State of Texas. In determining the successful offeror, the following criteria and weights will be used by the selection committee:

Proposal Amount	55
Proposed Completion Time	5
Proposed Project Staff	12
Proposers Experience on Similar Projects	12
Overall Reputation of the Proposer	16
Highest Possible Score	100

.1 The score assigned to each proposer for the Proposal Amount category will be calculated using the formula (1 - (P - L) ÷ L) x 55, where P is equal to the proposal amount submitted and L is the amount of the lowest proposal submitted. For the purpose of this evaluation, the Proposal Amounts shall include the cost of alternate Bid 1, the lowest amount between alternate bids (2 and 3), the lowest amount between alternate bids (4, 5, and 6), and the coast of alternate bids 7 and 8.

.2 Proposers submitting a Completion Time of less than or equal to 518 calendar days will be assigned a score calculated using the formula [1 – ((T –L) ÷ L)] x 5, where T is equal to the proposed Completion Time submitted and L represents the lowest completion time submitted. Each proposer submitting a Completion Time of greater than 518 calendar days will be awarded a score of 0. For the purpose of this evaluation, only the Completion Time submitted for the work included in the Base Bid will be considered.

.3 The score assigned to each proposer for the Proposed Project Staff, Proposers Experience on Similar Projects, and Overall Reputation of the Proposer categories will be determined by a committee consisting of Pasadena ISD administrators and the Architect. The committee will use information included in each proposer's qualification statement, information obtained from references listed by the proposers in their qualification statements, and assessments of each proposer based on past experience working with members of the committee to determine the scores assigned.

*Add subparagraphs **5.3.3** and **5.3.4** as follows:*

5.3.3 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.

5.3.4 Proposals received from nonresident Bidders will be evaluated by the Owner as required by House Bill 620, 69th Legislature, 1985.

ARTICLE 7 -- PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

*Change the last sentence of subparagraph **7.1.1** to read as follows:*

"Bonds may be secured through the Bidder's usual sources, except as required otherwise."

*Add the following sentence at the end of subparagraph **7.1.1**:*

"Refer to **§11.4** of Document 00 72 00, General Conditions, and Document 00 73 00, Supplementary Conditions."

*Delete subparagraph **7.1.3** in its entirety, and replace it with the following:*

7.1.3 Bonding Companies (Sureties) shall comply with the requirements of Article 11 of Document 00 72 00, General Conditions, and Document 00 73 00, Supplementary Conditions.

7.2 TIME OF DELIVERY AND FORM OF BONDS

*Delete subparagraphs **7.2.1** and **7.2.2** in their entirety, and replace them with the following:*

7.2.1 The Offeror shall deliver the required bonds to the Owner with the executed Agreement forms.

7.2.2 The bonds shall be written on Document 00 61 13.13, Performance Bond Form, and Document 00 61 13.16, Payment Bond Form, which are bound into the Project Manual. Both bonds shall be written in the amount of the Contract Sum.

*At subparagraph **7.2.3**, delete the phrase* "on or after".

*Add **Article 9** as follows:*

ARTICLE 9 -- ADDITIONAL INFORMATION AND INSTRUCTIONS

9.1 SALES TAX

9.1.1 The Owner is exempt from all Sales Tax. Refer to **§3.6** of Document 00 73 00, Supplementary Conditions.

9.2 WAGE RATES

9.2.1 The Owner has adopted a schedule of minimum wage rates for employees used in the construction of this project. Refer to **§3.21** of Document 00 73 00, Supplementary Conditions, and Document 00 73 43, Wage Rate Requirements.

9.3 HAZARDOUS MATERIALS

9.3.1 The use of any construction process or the installation of any materials containing the following is strictly prohibited on this project

- **.1** Asbestos
- **.2** Lead
- **.3** P.C.B. (Polychloride Biphenyls)
- **.4** Refrigerants R-11, R-12, R-113, R-114, R-500 and R-502

9.3.2 Prior to submitting a Proposal, each Offeror shall notify the Architect in writing of any materials or systems in the Bidding Documents which he has reason to believe contain any of the above listed items.

9.3.3 The Contractor shall comply with the requirements of Chapter 161, Subchapter Q, Installation of Asbestos, of the Texas Health and Safety Code and Chapter 1954, Asbestos Health Protection, of the Texas Occupations Code.

9.4 TOBACCO FREE CAMPUS

9.4.1 The Owner has designated their District as a tobacco free school district; therefore, the use of any tobacco will not be permitted anywhere on the project site at any time.

9.5 PREBID CONFERENCE

9.5.1 A prebid conference will be held at the date and time indicated in Document 00 11 19, Request for Competitive Sealed Proposals, at the offices of the Pasadena Independent School District Facilities and Construction Department, which are located at 1814 East Sam Houston Parkway South, Pasadena, Texas, 77503.

9.5.2 The Owner and the Architect will be represented, and all prospective Contractors are strongly urged to have a representative attend this conference.

END OF DOCUMENT 00 22 13

DOCUMENT 00 42 13.13

PROPOSAL FORM – PART ONE

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT (CSP #25P-034LP)

SUBMITTED BY: _____

SUBMITTED TO: Board of Trustees
Pasadena Independent School District
3920 Mickey Gilley Blvd.
Pasadena, Texas 77505

Having carefully examined the Contract Documents prepared by Texas Arcadis Inc., dated February 18 2025, and having examined the site conditions, the undersigned accepts the drawings and specifications as being satisfactory and adequate for the proper construction of the Work and proposes to furnish all labor, equipment and materials and perform all work for the completion of the above named project as stated below:

1. Base Bid

1.1 The undersigned agrees to complete the Work for the lump sum of: _____

_____ Dollars $ _____
Amount written in words governs. Amount in figures

2. Completion Time

2.1 The undersigned agrees to substantially complete the **Base Bid Work** within calendar days after receipt of the fully executed agreement, subject to extensions of time granted in accordance with the Conditions of the Contract.

3. Alternates

3.1 Refer to Document 00 42 13.16, Proposal Form – Part Two.

4. Addenda

4.1 The undersigned acknowledges receipt of Addenda Nos. _____ dated,

_____, 20_____,

issued during time for bidding, and has included the revisions described therein in this Proposal.

5. Changes in the Work

5.1 The undersigned understands that changes in the Work shall be performed in accordance with the Supplementary Conditions.

6. Liquidated Damages

6.1 The undersigned understands that Liquidated Damages, as defined in the Supplementary Conditions, will be included in the Form of Agreement Between Owner and Contractor and that the Contractor shall be bound thereto.

7. Allowances

7.1 The undersigned certifies that the allowances specified are included in the Base Bid and that the unexpended balance of the allowance sums will revert to the Owner in the final settlement of the Contract.

8. Offeror's Proposed Surety: _____

9. In submitting this Proposal, the undersigned agrees to the following, as more fully described in the Contract Documents:

9.1 This Proposal will remain subject to acceptance for 60 days after the day of Proposal opening.

9.2 The Owner has the right to waive irregularities and to reject this or any other proposal.

9.3 The Offeror accepts the provision of the Instructions to Bidders regarding disposition of Bid Security.

9.4 The Offeror is familiar with federal, state, and local laws and regulations.

9.5 The Offeror will sign and return the Agreement with the Bonds, Insurance, and other documents required by the Bidding Requirements within 5 days after they are presented to the Offeror for signature.

_____
Authorized Signature

_____
Name

_____
Title

(SEAL, if a Corporation)
State whether Corporation,
Partnership or Individual

_____
Name of Contracting Firm

_____
Street Address

_____
City/State/Zip Code

_____
Telephone No.

_____
Fax No.

_____
Date

END OF DOCUMENT 00 42 13.13

DOCUMENT 00 42 13.16

PROPOSAL FORM - PART TWO

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT (CSP #25P-034LP)

SUBMITTED BY: _____

SUBMITTED TO: Board of Trustees
Pasadena Independent School District
3920 Mickey Gilley Blvd.
Pasadena, Texas 77505

Having carefully examined the Contract Documents prepared by Texas Arcadis Inc., dated February 18 2025, and having examined the site conditions, the undersigned accepts the drawings and specifications as being satisfactory and adequate for the proper construction of the Work and proposes to furnish all labor, equipment and materials and perform all work for the completion of the above named project as stated below:

1. Base Bid

1.1 Refer to Document 00 42 13.13, Proposal Form – Part One.

2. Completion Time

2.1 The undersigned agrees to substantially complete **the Base Bid Work and the Work of all accepted Alternates** within _____ calendar days after receipt of the fully executed agreement, subject to extensions of time granted in accordance with the Conditions of the Contract.

3. Alternates

3.1 The undersigned agrees to complete the Work identified as Alternates as follows:

a. Alternate No. 1: Air Cooled Chillers - DAIKIN

01 This alternate shall establish the amount the Base Bid is increased depending on which chillers are provided. There is no chiller provided in the base bid.

Add / Deduct $ _____

b. Alternate No. 2: Air Cooled Chillers - TRANE

01 This alternate shall establish the amount the Base Bid is increased depending on which chillers are provided. There are not chillers provided in the base bid.

Add / Deduct $ _____

c. Alternate No. 3: Air Cooled Chillers - CARRIER

01 This alternate shall establish the amount the Base Bid is increased depending on which chillers are provided. There are not chillers provided in the base bid.

Add / Deduct $ _____

d. Alternate No. 4: BCMS - UNIFY

01 This alternate shall establish the amount the Base Bid is increased depending on which Building Control Monitoring System (BCMS) is provided. There is not BCMS provided in the base bid. GC should provide pricing for each system shown in Alternates 1, 3, and 5 as indicated below:

a. Alternate 4A: BCMS – Daikin/Unify
b. Alternate 4B: BCMS – Trance/Unify

c. Alternate 4C BCMS – Carrier/Unify

Add / Deduct $ _____

e. Alternate No. 5: BCMS - ALC

01 This alternate shall establish the amount the Base Bid is increased depending on which Building Control Monitoring System (BCMS) is provided. There is no BCMS provided in the Base Bid. GC Should provide pricing for each system shown in Alternates 1, 3, and 5 as indicated below:

a. Alternate 5A: BCMS – Daikin/ALC
b. Alternate 5B: BCMS – Trance/ALC
c. Alternate 5C: BCMS – Carrier/ALC

Add / Deduct $ _____

f. Alternate No. 6: Base Bid Correction

01 This alternate shall establish the amount the Base Bid is changed from the Base Proposal Amount indicated on Document 00 42 13.13 Bid Proposal Form-Part One. The correction is made solely at the discretion of the Proposer to adjust the Base Proposal amount submitted prior to submittal of Alternate proposals. There is no scope associated with this Alternate.

Add / Deduct $ _____

4 Addenda

4.1 Refer to Document 00 42 13.13, Proposal Form – Part One.

5 Changes in the Work

5.1 The undersigned understands that changes in the Work shall be performed in accordance with the Supplementary Conditions.

6 Liquidated Damages

6.1 The undersigned understands that Liquidated Damages, as defined in the Supplementary Conditions, will be included in the Form of Agreement Between Owner and Contractor and that the Contractor shall be bound thereto.

7 Allowances

7.1 Refer to Document 00 42 13.13, Proposal Form – Part One.

8 In submitting this Proposal, the undersigned agrees to the following, as more fully described in the Contract Documents:

8.1 This Proposal will remain subject to acceptance for 60 days after the day of Proposal opening.

8.2 The Owner has the right to waive irregularities and to reject this or any other proposal.

8.3 The Offeror accepts the provision of the Instructions to Bidders regarding disposition of Bid Security.

8.4 The Offeror is familiar with federal, state, and local laws and regulations.

8.5 The Offeror will sign and return the Agreement with the Bonds, Insurance, and other documents required by the Bidding Requirements within 5 days after they are presented to the Offeror for signature.

_____
Authorized Signature

_____
Name

_____

Title

(SEAL, if a Corporation)
State whether Corporation,
Partnership or Individual

Name of Contracting Firm

Street Address

City/State/Zip Code

Telephone No.

Fax No.

Date

END OF DOCUMENT 00 42 13.16

DOCUMENT 00 43 13

BID SECURITY FORM

KNOW ALL MEN BY THESE PRESENTS, that we _____

_____ as Principal, and

_____ as Surety, are held and firmly bound unto the Pasadena Independent School District, Pasadena, Harris County, Texas, hereinafter called the Owner, in the penal sum of _____

_____

($ _____) Dollars, lawful money of the United States, for payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted the accompanying bid, dated _____, 20_____, being for:

2022 BOND – NEW WILLIAMS ELEMENTRY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

the kind and extent of work involved being set forth in detail in the proposed Contract Documents cited herein.

NOW, THEREFORE, if the Principal shall not withdraw the accompanying bid within sixty (60) days after the date set for opening thereof, and shall within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Owner in accordance with the bid as accepted; and give Bond and good and sufficient surety for the faithful performance and proper fulfillment of such contract including payment of all persons supplying labor or materials therefor, or in the event of the withdrawal of said bid within the period specified, or the failure to enter into such contract and give such bond within the time specified, if the principal shall pay to the Owner the difference between the aggregate amount for which the Owner may enter into a contract for the same work with another Bidder; if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their several seals this _____day of _____, 20____, the name and Corporate Seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representatives, pursuant to authority of its governing body.

SURETY	**PRINCIPAL**
_____	_____
By _____	By _____
Name _____	Name _____
Title _____	Title _____
_____	_____
Business Address _____	Business Address _____
Telephone No. _____	Telephone No. _____
Witness _____	Witness _____
Name _____	Name _____
Title _____	Title _____

END OF DOCUMENT 00 43 13

DOCUMENT 00 45 18

FELONY CONVICTION NOTIFICATION

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Texas Education Code, Chapter 44, 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 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 of business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract."

This notice is not required of a publicly held corporation.

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

Name of Vendor _____

Name of Authorized Company Official (Printed) _____

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

   Signature of Authorized Company Official _____ Date _____

B. My firm is not owned nor operated by anyone who has been convicted of a felony.

   Signature of Authorized Company Official _____ Date _____

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

   Name of Individual(s): _____

   _____

   Details of Conviction(s): _____

   _____

   Signature of Authorized Company Official _____ Date _____

END OF DOCUMENT 00 45 18.

DOCUMENT 00 45 19

AFFIDAVIT OF NON-COLLUSION

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

By submission of this bid or proposal, the undersigned certifies that:

A. The bid or proposal has been independently arrived at without collusion with any other bidder or with any other competitor;

B. This bid or proposal has not been knowingly disclosed and will not be knowingly disclosed, to any other bidder or competitor or potential competitor, prior to the opening of the bids, or proposals for this project;

C. No attempt has been or will be made to induce any other person, partnership or corporation to submit or not submit a bid or proposal;

D. The undersigned certifies that he is fully informed regarding the accuracy of the statements contained in this certification, and that the penalties herein are applicable to the bidder as well as to any person signing in his behalf.

_____ _____

Authorized Agent (Print Name) Date

_____

Signature

_____

Company Name

_____

Company Address

_____

City State Zip

END OF DOCUMENT 00 45 19

SECTION 00 45 20

DISCLOSURE OF INTERESTED PARTIES

PASADENA ISD CERTIFICATE OF INTERESTED PARTIES – FORM 1295

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

Pasadena ISD 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 Pasadena ISD 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 Pasadena ISD at the time business entity submits the signed contract/proposal. The Texas Ethics Commission has adopted rules requiring the business entity to file Form 1295 electronically with the Texas Ethics Commission.

"Interested Party" means a person:

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

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

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

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

The completed Form 1295 with the certification of filing must be filed with Pasadena ISD by attaching the completed form to the vendor's proposal.

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

END OF DOCUMENT 00 45 20

DOCUMENT 00 45 21

PROPOSAL EVALUATION WAIVER

2022 BOND – NEW WILLIAMS
ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

By submitting a Proposal, the proposer indicated below agrees to waive any claim it has or may have against the Owner, Architect, Engineers, Consultants and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any proposal. The proposer further agrees the Owner reserves the right to waive any requirements under the proposal documents or the Contract Documents, with regards to acceptance or rejection of any proposals, and recommendation or award of the contract.

The Statement of Affirmation must be notarized.

STATEMENT OF AFFIRMATION
"The undersigned affirms that he/she is duly authorized to execute this waiver by the person(s) or business entity making the proposal."

Firm's Name: _____

Address: _____

_____

Proposer's Name: _____

Position/Title: _____

Proposer's Signature: _____

Position/Title: _____

STATE OF TEXAS

COUNTY OF HARRIS

SUBSCRIBED and **SWORN TO** before me on this _____ day of _____, 2024.

Notary Public: _____

My Commission Expires: _____

This form must be executed, notarized, and submitted with proposal.

END OF DOCUMENT 00 45 21

DOCUMENT 00 45 22

CONFLICT OF INTEREST QUESTIONNAIRE

FORM CIQ

For vendor or other person doing business with local governmental entity

This questionnaire reflects changes made to the law by H.B. 1491, 80th Leg., Regular Session.

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

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

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

OFFICE USE ONLY

Date Received

1 **Name of person 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 the originally filed questionnaire becomes incomplete or inaccurate.)

3 **Name of local government officer with whom filer has employment or business relationship.**

_____

Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

C. Is the filer of this questionnaire employed by a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership of 10 percent or more?

☐ Yes ☐ No

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

4

_____ _____

Signature of person doing business with the governmental entity Date

Adopted 06/29/2007

END OF DOCUMENT 00 45 22

DOCUMENT 00 45 33

CERTIFICATE OF NON-SEGREGATED FACILITIES

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Applicable to Contracts, Subcontracts, and Agreements with Applicants who are themselves performing Federally assisted construction contracts, exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause.

By the submission of this Proposal, the Proposer, Offeror, Applicant, or Subcontractor certifies that they do not maintain or provide for their employees any segregated facilities at any of their establishments, and that they do not permit their employees to perform their services at any location, under their control, where segregated facilities are maintained. The Proposer certifies further that they will not maintain or provide for their employees any segregated facilities at any of their establishments and that they will not permit their employees to perform their services at any location, under their control, where segregated facilities are maintained. The Proposer, Offeror, Applicant, or Subcontractor agrees that a breach of this Certification is a violation of the Equal Opportunity Clause in this proposed contract. As used in this Certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The Proposer further agrees that (except where they have obtained identical certifications from proposed Subcontractors for specific time periods) he will obtain identical certification from proposed Subcontractors prior to the award of Subcontracts exceeding
$10,000 which are not exempt from the provisions of the Equal Opportunity Clause; that they will retain such certifications in their files; and that the Proposer will forward the following notice to such proposed Subcontractors (except where the proposed Subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NON-SEGREGATED FACILITIES

A Certification of Non-segregated Facilities, as required by the May 9, 1967, Order (32 F.R. 7439, May 19, 1967) or elimination of segregated facilities, by the Secretary of Labor, must be submitted prior to the award of a Subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity Clause. The Certification may be submitted either for each Subcontract or for all Subcontracts during a period (i.e. quarterly, semi-annually, or annually).

The penalty for making false statements in offers is prescribed in 18 U.S.C. § 1001.

_____
Name of Company

_____
Signature

_____
Title

STATE OF TEXAS

COUNTY OF HARRIS

SUBSCRIBED and **SWORN TO** before me on this _____ day of _____, 20_____.

Notary Public: _____ My Commission Expires: ____

END OF DOCUMENT 00 45 33

DOCUMENT 00 45 35

EQUAL OPPORTUNITY EMPLOYER STATEMENT

2022 BOND – NEW WILLIAMS
ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Submitted to: **Pasadena Independent School District 3920**
Mickey Gilley Blvd.
Pasadena, Texas 77505

Date: _____

Company Name: _____

P. O. Box: _____

Street Address: _____

City: _____ State: _____ Zip Code: _____

The Pasadena Independent School District can do business only with those contractors and vendors who are Equal Opportunity Employers and requires that this form be completed and submitted with the Proposal Form in order for the proposal to be considered responsive at the time the proposal is submitted.

1. Name of Owner or President: _____ Phone: _____
2. Current total employment: _____ No. of males: _____ No. of females: _____
3. Of the total number of persons currently employed, please provide the following race or ethnic breakdown:

   No. of whites: _____ No. of Hispanics: _____ No. of African-Americans: _____

   No of other minorities: _____
4. Do you advertise as an equal opportunity employer? Yes ☐ No ☐
5. Do you have a written nondiscriminatory policy on employment? Yes ☐ No ☐
6. Has this policy been circulated throughout your organization? Yes ☐ No ☐
7. Name and title of the person to contact should any questions arise.

_____

Name Title Phone

Contractors that have previously submitted an Equal Opportunity Employer Statement and/or an Equal Opportunity Employer Affidavit are nonetheless required to complete these forms, provide updated information and submit it with the Bid.

END OF DOCUMENT 00 45 35

DOCUMENT 00 45 36

EQUAL OPPORTUNITY EMPLOYER AFFIDAVIT

2022 BOND – NEW WILLIAMS
ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Submitted to: **Pasadena Independent School District 3920**
Mickey Gilley Blvd.
Pasadena, Texas 77505

STATE OF _____

COUNTY OF _____

This company, contractor or subcontractor agrees to refrain from discrimination in terms and conditions of employment on the basis of race, color, religion, sex or national origin, and agrees to take affirmative action as required by Federal Statutes and Rules and Regulations issued pursuant thereto in order to maintain and insure nondiscriminatory employment practices.

_____, being duly sworn, deposes and says that they are the
Printed Name

_____ of _____,
Title Company Name

and that all statements herein contained are true and correct.

_____
Signature

SUBSCRIBED and **SWORN TO** before me on this _____ day of _____, 20_____.

Notary Public: _____

My Commission Expires: _____

END OF DOCUMENT 00 45 36

DOCUMENT 00 52 10

CERTIFICATION REGARDING TERRORIST ORGANIZATIONS

AND BOYCOTT OF ISRAEL

2022 BOND – NEW WILLIAMS
ELEMENTARY SCHOOL REPLACEMENT

Submitted to: Pasadena Independent School District
3920 Mickey Gilley Blvd.

Pursuant to Subtitle F, Title 10 of the Texas Government Code, Chapter 2252, per Senate Bill 252, passed by the State of Texas Legislature effective September 1, 2017, Section 2252.152 prohibits a governmental entity from entering into a contract with companies engaged in business with Iran, Sudan, or any foreign terrorist organization identified on a list of companies known to have contracts with or provide supplies or services to a foreign terrorist organization prepared and maintained by the Comptroller under Section 806.051, 807.051, or 2252.153.

Pursuant to Section 1, Subtitle F, Title 10 of the Texas Government Code, Chapter 2270, per House Bill 89, passed by the State of Texas Legislature effective September 1, 2017, Section 2270.022 "Prohibits a governmental entity from entering a contract with a company for goods or services without verification that the company 1) Does not boycott Israel and 2) Will not boycott Israel during the term of the Contract."

The Pasadena Independent School District can do business only with a company, vendors or individuals as defined by the Governmental Code 808.001 that does not boycott Israel and will not boycott Israel during the term of the Contract. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or a person or entity doing business in Israel, or is an Israeli-Controlled Territory, but does not include an action made for ordinary business purposes.

The undersigned certifies that the proposer does not boycott Israel and is not engaged in business with Iran, Sudan, or any foreign terrorist organization.

_____ _____
Company Name Date

_____
Company Street Address

_____
City State Zip

_____
Authorized Agent (print name)

_____
Signature

_____
Title

STATE OF TEXAS

COUNTY OF HARRIS

SUBSCRIBED and **SWORN TO** before me on this _____ day of _____, 2024.

Notary Public: _____

My Commission Expires: _____

END OF DOCUMENT 00 52 10

DOCUMENT 00 52 13 AGREEMENT
FORM

1 FORM OF AGREEMENT

1.1 The contract for construction of this Project shall be executed by the successful Offeror on the *Standard Form of Agreement Between Owner and Contractor*, AIA Document A101 – 2007, modified to meet the Conditions of this Project.

2 CONDITIONS OF THE CONTRACT

2.1 Document 00 72 00, The *General Conditions of the Contract for Construction*, AIA Document A201 – 2017, is hereby specifically made a part of the Contract Documents, whether attached hereto or not; and as supplemented and amended herein, constitutes the General Conditions.

2.2 Document 00 73 00, Supplementary Conditions, contains modifications to the *General Conditions of the Contract for Construction*, AIA Document A201 – 2017. Provisions of the General Conditions unaltered by the Supplementary Conditions shall remain in effect.

END OF DOCUMENT 00 52 13

DOCUMENT 00 61 13.13

PERFORMANCE BOND FORM

KNOW ALL MEN BY THESE PRESENTS, that we _____

_____, a Corporation of the State of Texas, with home office and principal place of business in _____, Texas, hereinafter called “Principal”, and _____

_____, a Corporation of the State of

_____, hereinafter called "Surety", are held and firmly bound unto the Pasadena Independent School District, hereinafter called “Owner”, in the amount of _____

_____

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

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has entered into a certain contract with the Owner, dated the ___ day of _____, 20____, for the complete construction on the property of the Owner, located in Harris County, Texas, of the work described as:

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Which said Contract and Documents referred to therein is herein now referred to and made part hereof as fully and completely as if copied in detail herein.

NOW, THEREFORE, the condition of this obligation is such that if said Principal shall well and truly and faithfully perform all the undertakings, covenants, terms, conditions, and agreements of said Contract, including, but not limited to, the faithful performance of the work required in accordance with the Contract Documents, during the original term thereof and extension thereof which may be granted by the Owner with or without notice to the Surety, and if said Principal shall satisfy all claims and demands incurred under such contract and shall fully indemnify, defend, and save harmless the Owner from all costs, damages and reasonable expenses which it may suffer by reason of failure so to do and shall fully reimburse and repay the Owner all outlay and expenses, including attorney’s fees, which the Owner may incur in making good any default, and shall reimburse and repay the Owner for all costs, including attorney’s fees, which the Owner may incur in the prosecution or defense of any suit or proceeding arising out of the breach or default of the Principal, then this obligation shall be void; otherwise, to remain in full force and effect.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alterations or additions to the terms of the Contract or to the work to be performed thereunder, or of the specifications accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of such change, extensions of time, alterations or additions to the terms of the Contract or to the work or to the specifications thereunder.

It is expressly provided that if any legal action shall be filed upon this bond, venue shall lie in Harris County, Texas.

Simultaneously with the execution of this Performance Bond, the parties hereto have executed a Payment Bond, reference to which is made for all purposes. Nothing in this Performance Bond shall any way invalidate or nullify the obligations of the parties as set forth in said Payment Bond.

Provided, however, that this bond is executed pursuant to the provisions of Texas Government Code, Section 2253, et. seq., and liabilities on this bond shall be determined in accordance with the provisions of said Section to the same extent as if it were copied at length herein.

Provided, however, that nothing in the bond shall be construed to limit the rights of the beneficiaries of this Bond which they might have under general, special or common law of the State of Texas not inconsistent with the terms hereof and not inconsistent with the provisions of Section 2253.

IN TESTIMONY WHEREOF, the parties hereto have executed this instrument on this _____ day of _____, 20___.

SURETY	**PRINCIPAL**
_____	_____
By _____	By _____
Name _____	Name _____
Title _____	Title _____
Business Address _____	Business Address _____
_____	_____
Telephone No. _____	Telephone No. _____
Witness _____	Witness _____
Name _____	Name _____
Title _____	Title _____

APPROVED AS TO FORM:
PASADENA INDEPENDENT SCHOOL DISTRICT

By _____ Name _____ Title __

END OF DOCUMENT 00 61 13.13

DOCUMENT 00 61 13.16 PAYMENT
BOND FORM

KNOW ALL MEN BY THESE PRESENTS, that we _____
_____, a Corporation of the State of Texas, with home office and principal place of business in _____, Texas, hereinafter called "Principal", and _____
_____, a Corporation of the State of
_____, hereinafter called "Surety", are held and firmly bound unto the Pasadena Independent School District, hereinafter called "Owner", for the use and benefit of all persons, firms and corporations who may furnish material or perform labor upon the buildings or improvements hereinafter referred to, in the penal sum of _____

_____

($ _____) Dollars (the Contract Price) for payment whereof the said principal and surety bind themselves and their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has entered into a certain contract with the Owner, dated the _____ day of _____, 20____, for the complete construction on the property of the Owner, located in Harris County, Texas, of the work described as:

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

which said Contract and Documents referred to therein is herein now referred to and made part hereof as fully and completely as if copied in detail herein.

NOW, THEREFORE, the condition of this obligation is such that if said Principal shall promptly make payment to all persons, firms and corporations who may furnish material or perform labor in the prosecution of the work provided for in such Contract, and extension or modification thereof, then this obligation shall be void; otherwise, to remain in full force and effect.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alterations or additions to the terms of the Contract or to the work to be performed thereunder, or of the specifications accompanying the same, shall in anywise affect its obligation on this bond, and it does hereby waive notice of such change, extensions of time, alterations or additions to the terms of the Contract or to the work or to the specifications thereunder.

No final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied, and it is expressly provided that if any legal action shall be filed upon this bond, venue shall lie in Harris County, Texas.

Simultaneously with the execution of this Payment Bond, the parties hereto have executed a Performance Bond, reference to which is made for all purposes. Nothing in this Payment Bond shall any way invalidate or nullify the obligations of the parties as set forth in said Performance Bond.

Provided, however, that this bond is executed pursuant to the provisions of Texas Government Code, Section 2253, et. Seq., and liabilities on this bond shall be determined in accordance with the provisions of said Section to the same extent as if it were copied at length herein.

Provided, however, that nothing in the bond shall be construed to limit the rights of the beneficiaries of this Bond which they might have under general, special or common law of the State of Texas not inconsistent with the terms hereof and not inconsistent with the provisions of Section 2253.

IN TESTIMONY WHEREOF, the parties hereto have executed this instrument on this _____ day of _____, 20____.

SURETY	**PRINCIPAL**
_____	_____
By _____	By _____
Name _____	Name _____
Title _____	Title _____
Business Address _____	Business Address _____
_____	_____
Telephone No. _____	Telephone No. _____
Witness _____	Witness _____
Name _____	Name _____
Title _____	Title _____

APPROVED AS TO FORM:
PASADENA INDEPENDENT SCHOOL DISTRICT

By _____ Name _____ Title __

END OF DOCUMENT 00 61 13.16

DOCUMENT 00 61 16

INDEMNITY AND HOLD HARMLESS AGREEMENT

STATE OF TEXAS §

COUNTY OF _____ §

This Agreement is made by and between Pasadena Independent School District (called "Owner") and

_____ (called "Contractor"), to be effective from its date of execution, in which Contractor, as condition precedent to its engagement to perform supervise, and subcontract particular work on behalf of Owner referred to for all purposes as the

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

(called "Project") agrees to indemnify and hold harmless Owner, its Board of Trustees, individually and in their capacities, and all employees and agents of Owner, from any and all claims, actions, demands, suits, causes or otherwise, for personal injury, death or property damage, arising out of or related directly or indirectly to the Project, brought by or on behalf of any person, group of persons, or legal entity.

All contracts and other documents relating to the Project are hereby incorporated herein and deemed to be a part hereof by reference. Further, Contractor agrees that the consideration which it is to receive for the performance of work under Project be deemed adequate consideration for the execution of this indemnity and hold harmless agreement, of which it forms an integral part.

Executed in duplicated originals this_____day of_____, 2025.

By:_____
Its Authorized Representative

_____
CONTRACTOR

PASADENA INDEPENDENT SCHOOL DISTRICT

By: _____
Its Authorized Representative

_____
OWNER

END OF DOCUMENT 00 61 16

DOCUMENT 00 62 08

SB9 CONTRACTOR CERTIFICATION

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Introduction: Texas Education Code Chapter 22 requires service contractors to obtain criminal history record information regarding covered employees and to certify to the District that they have done so. Covered employees with disqualifying convictions are prohibited from serving at a school district.

Definitions:

Covered Employees: All employees of a contractor who have or will have continuing duties related to the service to be performed at the District and have or will have direct contact with students. The District will be the final arbiter of what constitutes direct contact with students.

Disqualifying Conviction: one of the following offenses, if at the time of the offense, the victim was under 18 or enrolled in a public school: (a) a felony offense under title 5, Texas penal code; (b) an offense for which a defendant is required to register as a sex offender under chapter 62, Texas Code Of Criminal Procedure; or (c) an equivalent offense under federal law or the laws of another state.

On behalf of _____("contractor"), I certify that [check

one]: [ ] none of contractor's employees are covered employees, as defined above.

Or

[ ] some or all of contractor's employees are covered employees. If this box is selected, I further

certify That:

(1) Contractor has obtained all required criminal history record information, through the Texas Department of Public Safety, regarding its covered employees. None of the covered employees has a disqualifying conviction. Contractor has taken reasonable steps to ensure that its employees who are not covered employees do not have continuing duties related to the contract services or direct contact with students.

(2) if contractor receives information that a covered employee has a disqualifying conviction, contractor Will immediately remove the covered employee from contract duties and notify the district in writing within 3 business days.

(3) upon request, contractor will make available for the district's inspection the criminal history record Information of any covered employee. If the district objects to the assignment of a covered employee on The basis of the covered employee's criminal history record information, contractor agrees to discontinue Using that covered employee to provide services at the district.

Noncompliance by contractor with this certification may be grounds for contract termination. Signature _____

Date:_____

END OF DOCUMENT 00 62 08

DOCUMENT 00 62 09.1

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION REVIEW BY SERVICE CONTRACTOR

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

Submitted to: Pasadena Independent School District

3920 Mickey Gilley Blvd.
Pasadena, Texas 77505

STATE OF TEXAS §

COUNTY OF _____ §

(1) The undersigned representative, on behalf of the contracting firm identified below, swears and affirms to Pasadena Independent School District (the "District") that such firm has obtained, reviewed and verified, from a law enforcement or criminal justice agency, the criminal history record information of all employees of the contracting firm hired *before January 1, 2008*, who (i) have or will have continuing duties related to the contracted services, and (ii) have or will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee). The undersigned further certifies that no employees of the contracting firm who meet the requirements of (i) and (ii) herein have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

(2) The undersigned representative, on behalf of the contracting firm identified below, swears and affirms to the District, that such firm has obtained, reviewed and verified, from the Texas Department of Public Safety criminal clearinghouse, the national criminal history record information of all employees of the contracting firm hired *on or after January 1, 2008*, who (i) have or will have continuing duties related to the contracted services, and (ii) have or will have direct contact with students. The undersigned further certifies that no employees of the contracting firm, who meet the requirements of (i) and (ii) herein have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

(3) The undersigned firm swears and covenants that no present or future employee of the contracting firm, no present or future independent contractor, and no present or future employee or independent contractor of any subcontractor of the contracting firm, will provide services to the Project on a continuing basis that involve direct contact with students unless and until such employee's or independent contractor's national criminal history record information has been reviewed, cleared and certified, as required herein. In the event of an emergency, an employee or independent contractor who has not been previously certified may only provide services that involve direct contact with students if such employee is escorted by a District employee.

(4) The undersigned firm swears and covenants that, upon receipt of information, directly or indirectly, that any employee or independent contractor of the contracting firm has been convicted of an offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy, the contracting firm will immediately remove or cause the removal of such employee from the Project and notify the District.

(5) Furthermore, if requested by the District, the name, driver's license number, and any other national criminal history information of any person on the Project will be submitted to, and subject to periodic review by, the District.

_____, being duly sworn, affirms and certifies that he/she is the _____ (position) of _____ (contracting firm), and that all statements and acknowledgements contained herein are true and correct, and that he/she has the authority to bind such firm to the covenants set out above.

_____

SUBSCRIBED AND SWORN TO BEFORE ME this __ day of _____, 20_____.

Notary Public _____ State of _____

My Commission expires _____

END OF DOCUMENT 00 62 09.1

DOCUMENT 00 62 09.2

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION REVIEW BY SERVICE CONTRACTOR

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

Submitted to: Pasadena Independent School District

3920 Mickey Gilley Blvd.
Pasadena, Texas 77505

STATE OF TEXAS §

COUNTY OF _____ §

(1) The undersigned representative, on behalf of the subcontracting firm identified below, swears and affirms to Pasadena Independent School District (the "District") and to the Contractor identified above that such firm has obtained, reviewed and verified, from the Texas Department of Public Safety criminal clearinghouse, the national criminal history record information of all employees of the subcontracting firm who (i) have or will have continuing duties related to the subcontracted services, and (ii) have or will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee). The undersigned further certifies that no employees of the subcontracting firm who meet the requirements of (i) and (ii) herein have been convicted of any offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy.

(2) The undersigned representative, on behalf of the subcontracting firm identified below, swears and covenants that no present or future employee of the subcontracting firm, no present or future independent contractor, and no present or future employee or independent contractor of any sub-subcontractor of the subcontracting firm, will provide services to the Project on a continuing basis that involve direct contact with students unless and until such employee's or independent contractor's national criminal history record information has been reviewed, cleared and certified as required herein. In the event of an emergency, an employee or independent contractor who has not been previously certified may only provide services that involve direct contact with students if such employee is escorted by a District employee.

(3) The undersigned firm swears and covenants that, upon receipt of information, directly or indirectly, that any employee or independent contractor of the subcontracting firm has been convicted of an offense identified in Section 22.085 of the Texas Education Code or prohibited by District policy, the subcontracting firm will immediately remove or cause the removal of such employee from the Project and notify the District.

(4) Furthermore, if requested by the District, the name, driver's license number, and any other national criminal history information of any person on the Project will be submitted to the District.

_____, being duly sworn, affirms and certifies that he/she is the _____ (position) of _____ (contracting firm), and that all statements and acknowledgements contained herein are true and correct, and that he/she has the authority to bind such firm to the covenants set out above.

_____

SUBSCRIBED AND SWORN TO BEFORE ME this __ day of _____, 20_____.

Notary Public _____ State of _____

My Commission expires _____

END OF DOCUMENT 00 62 09.2

DOCUMENT 00 62 20

DEBARMENT FORM

2022 BOND – NEW WILLIAMS ELEMENTARY SCHOOL REPLACEMENT

PASADENA INDEPENDENT SCHOOL DISTRICT

Non-federal entities are prohibited from contracting with or making sub-awards under covered transaction to parties that are suspended or debarred or whose principals are suspended or debarred.

Vendor certifies that no suspension or disbarment is in place, which would preclude receiving a federally funded contract the federal OMB, A-102 Common Rule (§_.36)

Vendor Name: _____

Vendor Address:_____

Vendor Telephone: _____

Authorized Company Official's Name: _____
(Printed)

Signature of Company Official: _____

Date: _____

END OF DOCUMENT 00 62 20

DOCUMENT 00 73 00

SUPPLEMENTARY CONDITIONS

The following supplements modify AIA Document A201 – 2017, *General Conditions of the Contract for Construction* (refer to Document 00 72 00, General Conditions). The portions of the General Conditions not modified, supplemented or deleted by these Supplementary Conditions shall remain in effect. As appropriate, for purposes of this Request for Proposal, the term "Bid" shall mean "Proposal" and the term "Bidder" shall mean "Offeror" or "Proposer", wherever they appear in the Construction Documents.

ARTICLE 1 -- GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.3 THE WORK

*Add the following sentence at the end of **§ 1.1.3**:*

It also includes all supplies, skill, supervision, transportation services and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the contract and all other items of cost or value needed to produce, construct and fully complete the work identified by the Contract Documents.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

*Add **§ 1.2.1.1**, as follows:*

.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities.

.1 The Agreement

.2 Addenda, with those of later date having precedence over those of earlier date

.3 The Supplementary Conditions

.4 The General Conditions of the Contract for Construction

.5 Specifications

.6 Drawings

In the case of an inconsistency between the Drawings and Specifications or within either Document, not clarified by an Addendum, the better quality or greater quantity of Work shall be included in the Bid. Clarifications of the inconsistency will be accomplished with the Contractor after award of Contract and, if necessary, an appropriate reduction in the contract will be accomplished by Change Order. Figures given on Drawings govern scale measurements. Large scale Drawings take precedence over small scale Drawings. Written word takes precedence over numbers. Handwritten documents take precedence over typewritten documents. Existing conditions take precedence over Drawings and Specifications for dimensions and shall be verified by the Contractor. The Contractor proceeds at his own risk if conflicts or discrepancies are not resolved prior to the execution of all Work.

*Add **§ 1.7** as follows:*

§ 1.7 MISCELLANEOUS OTHER DEFINITIONS

§ 1.7.1 ABBREVIATIONS

N.I.C. Not in Contract. Indicating work not required to be done by this Contractor under this agreement.
ACI AMERICAN CONCRETE INSTITUTE
ADA AMERICANS WITH DISABILITIES ACT OF 1990
ADAAG AMERICANS DISABILITIES ACT ACCESSIBILITY GUIDELINES FOR BUILDINGS & FACILITIES
AIA AMERICAN INSTITUTE OF ARCHITECTS
AIEE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS AISC AMERICAN INSTITUTE OF STEEL CONSTRUCTION AISI AMERICAN IRON AND STEEL INSTITUTE
ANSI AMERICAN NATIONAL STANDARDS INSTITUTE ASA AMERICAN STANDARDS ASSOCIATION
ASTM ASTM INTERNATIONAL
AWSC AMERICAN WELDING SOCIETY
CODE FS FEDERAL SPECIFICATION
NBS NATIONAL BUREAU OF STANDARDS NEC NATIONAL ELECTRIC CODE
SPR SIMPLIFIED PRACTICE RECOMMENDATION
SAD 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN TAS TEXAS ACCESSIBILITY STANDARDS
UL UNDERWRITERS LABORATORIES, INC.

§ 1.7.2 ADDENDA, ADDENDUM

Documents issued by the Architect prior to execution of the Agreement between Owner and Contractor for this Project that modify or clarify the Bidding Documents. All addenda become a part of the Contract Documents.

§ 1.7.3 ALTERNATE BID(S)

A separate amount stated on the Bid Form that, if accepted by the Owner, will be added to or deducted from the Base Bid. If accepted, the work that corresponds to the alternate bid will become part of the Agreement between Owner and Contractor. Alternate bids shall remain valid for the same period of time as the Base Bid after receipt of bids, regardless if an Owner Contractor Agreement has been executed, unless indicated otherwise herein.

§ 1.7.4 APPROVED, APPROVED EQUIVALENT, APPROVED EQUAL, OR EQUAL

The terms Approved, Approved Equivalent, Approved Equal, and Or Equal, relate to the substitution of products or systems approved in writing by the Architect. Refer to Paragraph 3.19 (this Document), Substitution of Products and Systems, and Section 01 25 00, Substitution Procedures, for procedures that must be followed.

§ 1.7.5 BASE BID

The Contractor's bid for the Work, not including any Alternates.

§ 1.7.6 CONTRACT TIME

The period of time including Anticipated Weather Days that is established in the Contract Documents for Substantial Completion of the Work. This period of time is subject to authorized adjustments for Unanticipated Weather Days and other Calendar Day extensions of time as enumerated in the Contract Documents.

§ 1.7.7 DATE OF AGREEMENT

The date the Owner formally awards a Contract for Construction of the Work. This date will be inserted in the first page of the Agreement between Owner and Contractor and shall be referenced in Performance Bond and Payment Bond forms. See also Date of Commencement of Work.

§ 1.7.8 DATE OF COMMENCEMENT OF THE WORK

The date of a written Notice to Proceed to the Contractor for a given portion of the Work. This date constitutes day zero (0) of the stated Contract Time.

§ 1.7.9 DATE OF FINAL COMPLETION

The end of construction. See AIA Document A201, paragraph 9.10.

§ 1.7.10 DAY

The following days are referenced in the documents:

.1 Calendar Days: The days of the Gregorian Calendar. The Contract Time is established in Calendar Days. Extensions of time granted for Regular Work Days lost, if any, will be converted to Calendar Days.

.2 Holidays: The days officially recognized by the construction industry in this area as a holiday; normally limited to the observance days of New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and the day after, and Christmas Day.

.3 Regular Work Days: All calendar days except holidays, Saturdays, and Sundays. Requests for extensions of time shall be requested on the basis of Regular Work Days, and those days, if approved, will be converted to calendar days by multiplying by a factor of one and four-tenths (1.4).

.4 Anticipated Weather Days: An allowance of Regular Work Days, established as probable days lost due to weather delays; said allowance to be included in the Contractor's proposed Completion Time on his Bid Form.

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

.6 Net Weather Days: The difference in working days between Anticipated Weather Days and Weather Days.

.7 National Weather Bureau reports will be used as a standard for evaluation of excessive weather days claims.

§ 1.7.11 NOTICE TO PROCEED

A notice that may be given by the Owner to the Contractor that directs the Contractor to start the Work. It may also establish the Date of Commencement of the Work.

§ 1.7.12 PROVIDE

Whenever the word "provide" is used in these documents, it shall mean the same as "furnish and install".

§ 1.7.13 PUNCH LIST

A comprehensive list prepared by the Contractor prior to Substantial Completion to establish all items to be completed or corrected; this list may be supplemented by the Architect or Owner. Refer to Section 9.8 of Document 00 72 00, General Conditions of the Contract for Construction, and Section 01 77 00, Closeout Procedures.

§ 1.7.14 UNIT PRICES

A cost for a unit of work as described in the Contract Documents. The Owner may add or deduct Unit Price work at the amounts stated on the Bid Form and such amounts shall not be subject to additional mark up by the Contractor or his subcontractors.

ARTICLE 2 -- OWNER

§ 2.1 GENERAL

*Delete **§ 2.1.1** in its entirety and substitute the following:*

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. All parties understand that only the Board of Trustees for the Owner acting as a body corporate has the expressed authority to bind the Owner with respect to all matters requiring the Owner's approval of authorization. Except as otherwise provided in subparagraph 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

*Delete **§ 2.1.2** in its entirety.*

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

*Add the following sentence at the end of **§ 2.2.3**:*

Under this provision the contracted Architect and Engineer are in no way relieved of their responsibilities outlined in this contract or other attached contracts for identification of existing conditions.

*Delete **§ 2.2.5** in its entirety and substitute the following:*

§ 2.2.5 The Contractor will be furnished free of charge 25 copies of Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage, and handling.

*Add **§ 2.5** as follows:*

§ 2.5 OWNER'S RIGHT TO OCCUPY THE PROJECT

§ 2.5.1 The Owner shall have the right to occupy or use without prejudice to the right of either party, any completed or largely completed portions of the project, notwithstanding the time completing the entire work or such portions may not have expired. Such occupancy and use shall not constitute acceptance of any work not in accordance with the Contract Documents.

§ 2.5.2 If such prior use delays the completion of the Project, the Contractor shall be entitled to extension of time, claim for which shall be made in writing with supporting data attached.

§ 2.5.3 Refer to Article 11, Insurance and Bonds, regarding property insurance requirements in the event of such occupancy.

ARTICLE 3 -- CONTRACTOR

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

*Add the following to the end of **§ 3.2.1**:*

The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized, or reasonably should have recognized such error, inconsistency or omission and failed to report it to the Architect.

Add **§ 3.2.5**, **§ 3.2.6**, **§ 3.2.7** and **§ 3.2.8** as follows:

§ 3.2.5 The Contractor shall not be entitled to additional compensation for the "rework portion" of any additional work caused by his failure to carefully study and compare the contract documents prior to execution of the work.

§ 3.2.6 The Contractor shall make reasonable attempt to interpret the Contract Documents before asking the Architect for assistance in interpretation. The Contractor shall not ask the Architect for observation of work prior to the Contractor's field superintendent's personal inspection of the work and his determination that the work complies with the Contract Documents.

§ 3.2.7 If, in the opinion of the Architect, the Contractor does not make a reasonable effort to comply with the above requirements of the Contract Documents and this causes the Architect or his Consultants to expend an unreasonable amount of time in the discharge of the duties imposed on him by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's additional services made necessary by such failure. The Architect will give the Contractor prior notice of intent to bill for additional services related to Articles 3.2.5, 3.2.6, and 3.12 before additional services are performed.

§ 3.2.8 If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor his Warranty, he shall promptly notify the Architect in writing, providing substantiation for his position. Any necessary changes, including substitutions of materials, shall be accomplished by appropriate Modification.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

*Delete **§ 3.3.1** in its entirety and substitute the following:*

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skills and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the job site safety thereof and, except as stated below, shall be fully and solely responsible for the job site safety of such means, methods, techniques, sequences or procedures. If the Contractor determines such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage, but only to the extent the Owner would be responsible for any such losses or damages under state and/or federal law.

*Add **§ 3.3.4** as follows:*

§ 3.3.4 Contractor shall bear sole responsibilities for design and execution of acceptable trenching and shoring procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, Subchapter C, Sections 756.021, et seq. On trench excavations in excess of 5 feet in depth, Contractor shall pay a qualified engineer, experienced in the engineering design and preparation of drawings and specifications for compliance with state requirements for trenching and shoring, to prepare and professionally seal detailed drawings and specifications directing Contractor in the safe execution of trenching and shoring.

§ 3.5 WARRANTY

*Delete the text of **§ 3.5** in its entirety and substitute the following:*

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new, unless the Contract Documents require or permit

otherwise. The contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect cause by abuse, material alteration to the Work not executed by the Contractor, insufficient maintenance or maintenance not in compliance with written instructions therefor, operation not in compliance with written instructions therefor, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

*Add **§ 3.5.2, § 3.5.2.1,** and **§ 3.5.3** as follows:*

§ 3.5.2 In the event of failure in the Work, including a specified product, whether during construction, or the correction period (which shall be one (1) year from the Date of Substantial Completion, except where a longer period as specified), the Contractor shall take prompt and appropriate measures to assure correction or replacement of the defective Work or any portion thereof, including manufactured products, whether notified by the Owner or the Architect. Upon correction of warranty items, the Contractor shall provide the Owner and Architect with written notification of said correction. This obligation shall survive acceptance of the Work under the Construction Contract.

§ 3.5.2.1 The Contractual Correction Period for this Project is one (1) year from the date of Substantial Completion, except for any extended warranties as specified within the Contract Documents. Items of Work not completed until after the deadline for Substantial Completions shall have their warranties (general and any extended warranty periods) extended by the period of time between the deadline for Substantial Completion and the actual completion of the Work. Such warranties shall be submitted to the Owner in writing, documenting such time extensions. This correction period shall not restrict or modify extended warranties called for or provided on systems, equipment or other specific portions of the Work.

§ 3.5.3 The Contractor shall accompany the Owner and Architect for a complete re-inspection of the Project approximately eleven (11) months after the Date of Substantial Completion and shall promptly complete any observed or reported deficiencies in the Work, including any uncompleted Punch List items or outstanding and incomplete warranty items. The contractor shall provide written notification to the Owner and Architect when said Punch List items and/or additional deficiencies observed have been corrected. This obligation shall survive acceptance of the Work under the Construction Contract.

§ 3.6 TAXES

*Delete **§ 3.6** in its entirety and substitute the following:*

§ 3.6 The Owner qualifies for exemption from State and Local Sales and Use Taxes pursuant to the provision of Article 20.04(f) of the Texas Limited Sales, Excise and Use Tax Act. Taxes normally levied on the purchase, rental and lease of materials, supplies and equipment used or consumed in performance of the Contract may be exempted by issuing to suppliers an exemption certificate in lieu of tax. Exemption certificates comply with State Comptroller of Public Accounts Ruling No. 95-0.07. Any such exemption certificate issued in lieu of tax shall be subject to State Comptroller of Public Accounts Ruling No. 95-0.09, as amended. Failure by the Contractor or Subcontractors to take advantage of the Owner's exemption and to obtain such exemption certificate shall make him responsible for paying taxes incurred on materials furnished on the Project without additional cost to or reimbursement by the Owner.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

*At **§ 3.7.1**, add the following subparagraphs:*

.1 The Owner shall pay directly to the governing authority the cost of all permanent property utility assessments and similar utility connection charges.

.2 The Contractor shall be responsible for obtaining and paying for all City and County Building Permits, Inspection Fees and Plan Checking Fees; temporary utility charges, tap charges, and water meter charges and any other similar fees assessed by jurisdictional authorities having control over this Project.

.3 The Owner shall pay fees payable to the Texas Department of Licensing and Regulation (TDLR) for document review relative to the Elimination of Architectural Barriers Act and the Architect will submit the documents to the TDLR for review and approval.

.4 SWPPP

§ 3.8 ALLOWANCES

*Delete **§ 3.8.1, § 3.8.2,** and **§ 3.8.3** in their entirety and substitute the following:*

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.

§ 3.8.2 Refer to Section 01 21 00, Allowances.

§ 3.8.3 Materials and equipment under an allowance shall be selected in a reasonable period of time by the Owner to avoid delays in the Work (Provided that if a decision is needed to avoid delay, Contractor shall notify Architect and Construction manager in a writing sufficiently in advance of needed date to allow reasonable time for selections to be made).

§ 3.9 SUPERINTENDENT

*Delete **§ 3.9.3** in its entirety and substitute the following:*

§ 3.9.3 The Superintendent shall be satisfactory to the Owner and shall not be changed except with the consent of the Architect, unless the Superintendent leaves the employment of the Contractor. No increase in Contract Time or Contract Sum shall be allowed in the event the Owner or Architects object to any nominated superintendent.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

*Add **§ 3.10.4**, **§ 3.10.5**, and **§ 3.10.6** as follows:*

§ 3.10.4 The process of approving Contractor's schedules and updates to Contractor's schedule shall not constitute a warranty by the Owner that any non- Contractor milestones or activities will occur as set out on Contractor's schedule. Approval of a Contractor's schedule does not constitute a commitment by the Owner to furnish any Owner-furnished information or material any earlier than Owner would otherwise be obligated to furnish that information or material under the Contract Documents. Failure of the Work to proceed in the sequence scheduled by Contractor shall not alone serve as the basis for a Claim for additional compensation or time. In the event there is interference with the Work, which is beyond its control, Contractor shall attempt to reschedule the Work in a manner that will hold resulting additional time and cost to a minimum. The construction schedule shall be in a detailed format satisfactory to the Owner and the Architect and shall meet the requirements set forth in Section 01 32 16, Construction Progress Schedule.

§ 3.10.5 The Owner's need for delivery of completed Work, or portions thereof, is largely controlled by the necessities of the school calendar and operations of school programs within the calendar year. Their needs are reflected in scheduled completion dates and milestone dates set out in the Contract Documents. The Contractor shall perform the work in such a way as to not interfere with school operations and the importance of meeting milestones and completion dates is not exclusive. The contractor acknowledges and agrees that if these dates are not met, there may be a relaxation in the needed delivery dates because of the school calendar. When it appears to not be the fault of the Contractor, Contractor will develop with PISD, Construction Manager and Architect a plan and a budget under the Change Order provision of the Contract Documents to delays, or suspending or otherwise slowing the Work to efficiently take advantage of any relaxation in Owner's need for the completed Work.

§ 3.10.6 The Owner shall have the right to reschedule the time of day for the performance of any part of the Work that may interfere with the operation of the Owner's premises or any tenants or invitees thereof. The Contractor shall, upon the Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any rescheduling of

performance of the Work under this Subparagraph 3.10.6 may be grounds for an extension of the Contract Time, if permitted under Subparagraph 8.3.1, and an equitable adjustments in the Contract Sum, if: (1) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents, (2) such rescheduling is required for the convenience of the Owner and is not attributable to any act of omission of Contractor, and (3) if Owner agrees to the Contract Sum adjustment prior to any rescheduling.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

*Add **§ 3.11.2** as follows:*

§ 3.11.2 The Contractor shall post all Addenda on Construction Documents prior to commencing work in the site.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

*Add **§ 3.12.11** as follows:*

§ 3.12.11 Comply with the requirements set forth in Section 01 33 00, Submittal Procedures.

§ 3.13 USE OF SITE

*Add **§ 3.13.1**, **§ 3.13.2**, **§ 3.13.3**, **§ 3.13.4**, and **§ 3.13.5** as follows:*

§ 3.13.1 When the Work is to be performed at an existing school location, Contractor shall schedule and perform the Work in a manner that does not compromise the safety to school, students, facility and staff and does not unreasonably disrupt or interfere with the continuing normal routine of the school. If a School Operations Parameters Statement is a part of the Contract Documents, Contractor will comply with its terms, at no increase in price.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

§ 3.13.4 Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any other provision on the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of:

.1 any area and buildings adjacent to the site or the Work or

.2 the Building in the event of partial occupancy.

§ 3.13.5 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrance, and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and the Building, as amended from time to time.

§ 3.15 CLEANING UP

*Add **§ 3.15.3** as follows:*

§ 3.15.3 Prior to the Architect's inspection for Substantial Completion the Contractor shall clean exterior and interior surfaces exposed to view in accordance with Section 01 77 00 – Closeout Procedures.

*Add **§ 3.19**, **§ 3.20**, **§ 3.21**and **§ 3.22** as follows:*

3.19 SUBSTITUTIONS OF PRODUCTS AND SYSTEMS, "OR EQUAL" BRANDS

3.19.1 The materials, products, and the systems covered by these specifications have been selected as a standard because of quality, particular suitability, or record of satisfactory performance. It is not intended to preclude the use of equivalent or better materials, products, or systems provided that it meets the requirements of the particular project and have been approved in an addendum as a substitution prior to the submission of bids. If prior written approval in an addendum has not been obtained, it will be assumed that the Bid is based upon the materials, products, and systems described in the Bidding Documents and no substitutions will be permitted, except as provided hereinafter.

3.19.2 If, after award of contract, the Contractor or one of his Subcontractors or Suppliers determines that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the work or to honor the Warranty, the Contractor shall promptly notify the Architect, in writing, providing detailed substantiation for his position. Any changes deemed necessary by the Owner and Architect, including substitution of materials and change in Contract Sum, either upward or downward, if any, shall be accompanied by appropriate Modification.

3.19.3 Substitution requests shall be submitted on the forms included herein and in accordance with the process established in Section 01 25 00, Substitution Procedures.

§ 3.20 RECORD DRAWINGS

§ 3.20.1 Comply with the requirements set forth in Section 01 78 39, Project Record Documents.

§ 3.21 PREVAILING WAGE RATES

§ 3.21.1 No employee used in this construction may be paid less than the minimum wage rate provided in Texas Government Code Section 2258. Refer to Document 00 73 43, Wage Rate Requirements, which is incorporated herein by reference.

§ 3.22 ANTITRUST VIOLATIONS

§ 3.22.1 Contractor hereby assigns to owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Section 1 et. seq. (1973). The Contractor shall include this provision in his contracts with each subcontractor and supplier. Each subcontractor shall include such provision in contracts with sub-subcontractors and suppliers.

ARTICLE 5 -- SUBCONTRACTORS

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

*Delete **§ 5.2.1** and **§ 5.2.2** in their entirety and substitute the following:*

5.2.1 As soon as practicable after award of the contract, but no later than 10 days prior to the submittal date for the contractor's first application for payment, the contractor shall furnish to the owner and architect, in writing, the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the work. Where subcontractors or sub-subcontractors have been listed in the specifications or in an

addendum as an approved subcontractor the proposed entity shall be one of those firms listed, unless agreement has been reached to accept a proposed substitute subcontractor as listed on the bid form. Regarding proposed persons or entities to perform portions of the work where no approved subcontractors have been listed or approved by addendum, the architect will promptly reply to the contractor in writing stating whether or not the owner or the architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the owner or architect to reply promptly shall constitute notice of no reasonable objection. Failure of the contractor to submit the subject names in a timely manner will delay processing of the contractor's application for payment.

5.2.2 The Contractor shall not contract with a proposed person or entity to which the Owner or Architect has made reasonable and timely objection.

*At the end of **§ 5.2.4**, add the following sentence:*

Prior to such change the Contractor shall notify the Architect of his intent and reasons for such proposed changes.

*Add **§ 5.2.5** as follows:*

5.2.5 The Contractor shall submit the list of proposed Subcontractors on AIA Document G805 or in a similar format approved by the Architect and Owner.

ARTICLE 7 -- CHANGES IN THE WORK

§ 7.1 GENERAL

*Delete the text of **§ 7.1.2** in its entirety and substitute the following:*

§ 7.1.2 A Change Order shall be based upon agreement among the Owner's Board of Trustees, Contractor and Architect; a construction change directive requires agreement by the Owner or the Owner's representative and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

*At the end of **§ 7.1.3**, add the following sentence:*

Except as permitted in Sections 7.2 or 7.3, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order.

*Add **§ 7.1.4** as follows:*

7.1.4 The Contractor, upon receipt of written notification by the Architect of a proposed item of change in the Work, shall prepare as soon as possible a Change Proposal in such form or forms as directed by the Architect.

- **.1** Each separate Change Proposal shall be numbered consecutively and shall include materials, cost, labor costs, fees, overhead and profit. The Proposal shall specify all cost related to the proposed Change in the Work, including any disruption or impact on performance.
- **.2** The Subcontractor's itemized accounting shall be included with the Change Proposal;
- **.3** If a change Proposal is returned to the Contractor for additional information or if the scope of the proposed change in the Work is modified by additions, deletions or other revisions, the Contractor shall revise the Change Proposal accordingly and resubmit the revised Change Proposal to the Architect and the Construction Manager;
- **.4** A revised Change Proposal shall be the original Change Proposal number suffixed by the letter "R" to designate a revision in the original Change Proposal. If additional revisions to a revised Change Proposal are necessary, each subsequent revision shall be identified by an appropriate numeral suffix immediately following the "R" suffix;

.5 Upon written approval of a Change Proposal by Owner, the Architect and the Construction Manager, the Architect will prepare a Change Order authorizing such change in the Work; and

.6 The Contractor shall request extensions of Contract Time due to changes in the Work only at the time of submitting its Change Proposal. Contractor's failure to do so shall represent a waiver of any right to request a time extension.

*Add **§ 7.2.2** as follows:*

7.2.2 Methods used in determining adjustment to the Contract Sum may include those listed below:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. Sufficient substantiating data shall include a proposal itemized for the various components of work added or deleted, segregated by labor, material and equipment. Details to be submitted will include detailed line item estimates showing detailed material quality take-offs, material prices by item and of related labor hour pricing information and extension (by line item by drawings as applicable);

.2 Unit prices stated in the Contract Documents or subsequently agreed upon and supported by sufficient substantiating data to permit evaluation;

.3 Cost to be determined in a manner agreed upon by the parties and mutually acceptable fixed or percentage fee or the percentage fee established at 7.3.7; or

.4 As provided in Subparagraph 7.3.7.

*Add **§ 7.5** as follows:*

§ 7.5 ALLOWABLE MARKUPS FOR CHANGES IN THE WORK

7.5.1 In Subparagraphs 7.2.2, 7.3.3, and 7.3.7 the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

.1 For the Contractor, for Work performed by the Contractor's own forces, a maximum total markup of 10 percent of the actual cost.

.2 For the Contractor for Work performed by the Contractor's Subcontractor(s), 5 percent of the amount due the Subcontractor(s).

.3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, a maximum markup of 10 percent of the actual cost.

.4 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, 5 percent of the amount due the Sub-subcontractor.

.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.6.

.6 In order to facilitate checking of quotations for extras or credits, all proposals of Contractors, Subcontractors, and Sub-subcontractors, (except those so minor that their propriety can be seen by inspection), shall be accompanied by complete and detailed work sheets showing itemization of costs including labor, materials, and other costs.

7.5.2 The Contractor will not be allowed any overhead and profit mark-up when changes in the work are funded by one of the Allowances.

ARTICLE 8 -- TIME

§ 8.1 DEFINITIONS

*Delete the text of **§ 8.1.1** in its entirety and substitute the following:*

§ 8.1.1 Refer to **§ 1.7.6** for the definition of Contract Time.

*Delete the text of **§ 8.1.2** in its entirety and replace it with the following:*

8.1.2 Unless agreed otherwise, the date inserted on the Agreement form and the Date of Commencement of the Work shall be as follows:

.1 The date inserted on the first page of the Agreement form will be the date the Owner formally awards the Contract. As soon as feasible after receipt of Bids, the Architect will present Agreement forms to the Contractor for his review and signature; the Contractor will be allowed a maximum of five (5) days from the date the prepared Agreements are presented to him to 1) obtain the required bond forms and insurance certificates and 2) return the executed Agreements and supporting documents to the Architect for transmittal to the Owner for his final review and execution.

.2 The Date of Commencement of the Work: Refer to subparagraph 1.7.8.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

*Delete the text of **§ 8.3.1** in its entirety and substitute the following:*

§ 8.3.1 If the Contractor is delayed at any time in the progress of the Work by any act of neglect of the Owner or the Architect, or by an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delays in deliveries, unavoidable casualties, Net Weather Days, or other causes beyond the Contractor's control, or by other causes which the Architect determines may justify the delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect and Owner may determine.

*Add **§ 8.3.4**, **§ 8.3.5**, **§ 8.3.6**, **§ 8.3.7**, and **§ 8.3.8**, as follows:*

§ 8.3.4 The parties hereto agree that time is of the essence of this Contract and that pecuniary damages would be suffered by the Owner if the Contractor does not substantially complete all Work called for in the Contract Documents by the specified date, which damages are, by their very nature, difficult of ascertainment. It is therefore expressly agreed, as a part of the consideration inducing the Owner to execute this Contract that the Owner may deduct from the final payment made to the Contractor a sum equal to $1,000.00 for each and every Calendar Day beyond the agreed date which the Contractor has agreed to for Substantial Completion of the Work included in the Contract Documents. It is expressly understood that said sum per day is agreed upon as a fair estimate of the pecuniary damages which will be sustained by the Owner in the event that the Work is not substantially completed within the agreed time, or with the legally extended time, if any, otherwise provided for herein. Said sum shall be considered as liquidated damages only, and in no sense shall be considered a penalty or forfeiture; said damage being caused by additional compensation to personnel, and other miscellaneous increased costs, all of which are difficult of exact ascertainment.

§ 8.3.5 Extensions of time granted for causes described herein will be granted on the basis of 1.4 Calendar Days extension for each Regular Working Day lost, except as modified by the provisions contained herein related to Anticipated Inclement Weather days.

§ 8.3.6 Each Proposer shall include in his proposed Contract Time an allowance of Anticipated Inclement Weather Days in accordance with the following schedule:

Number of Anticipated Inclement Weather Days to be included in Bid Completion Time (regular working days)

January 3	April.....2	July 4	October..... 3
February..... 4	May 5	August.....4	November 5
March..... 4	June 6	September 4	December 4

§ 8.3.7 Weather Days shall be as described in subparagraph 1.7.10.5. If such situations occur in more than the number of Anticipated Inclement Weather Days included in the Bid Completion Time and if those additional days prevent the Contractor from performing critical portions of the scheduled Work, extensions of time caused by inclement weather may be requested as enumerated hereinafter.

§ 8.3.8 At the beginning of each month the Contractor shall submit a monthly status report showing 1) the scheduled number of Anticipated Inclement Weather Days for the particular month, 2) the actual Weather Days requested, and 3) the Net Weather Days (plus, minus, or no change). At times deemed appropriate by the Architect or when requested in writing by the Contractor, the Contract Time will be adjusted by Change Order if the total of Net Weather Days is substantially greater than 0. If the Contractor fails to submit said monthly status report it will be assumed that none of the Anticipated Inclement Weather Days were used for that month and they shall accumulate for possible future offset against Net Weather Days; however, if at the end of the project all Anticipated Inclement Weather Days have not been used, the Contract Completion Time will not be reduced. An example of the monthly schedule to be submitted is as follows:

Weather Days (Regular)

Month	Anticipated	Actual Requested	Net
January	3	8	5
February	4	0	-4
March	4	2	-2
April	2	2	0
May	5	7	2
June	6	10	4
TOTALS	24	29	5

Using this example (and assuming that all requested days were approved), there were 5 Net Weather Days (regular working days) for the first six months of the project and the extension of Contract Time would be 7 calendar days (5 working days x 1.4 = 7 calendar days).

ARTICLE 9 -- PAYMENTS AND COMPLETION

§ 9.2 SCHEDULE OF VALUES

*Add **§ 9.2.2** as follows:*

§ 9.2.2 The schedule of values shall be prepared and submitted as stipulated in Section 01 29 00, Payment Procedures.

§ 9.3 APPLICATIONS FOR PAYMENT

*Delete **§ 9.3.1** in its entirety and substitute the following:*

§ 9.3.1 Applications for Payment shall be prepared and submitted as stipulated in Section 01 29 00, Payment Procedures.

*Delete **§ 9.3.1.1** in its entirety and substitute the following:*

§ 9.3.1.1 As provided in Section 7.3.9 (General Conditions), such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

*Delete **§ 9.3.2** in its entirety and substitute the following:*

§ 9.3.2 Payments will be made on account of materials or equipment that is suitably stored at some off site location meeting the following conditions:

.1 The Owner and Surety must agree to the location in writing.

.2 The location must be a bonded warehouse.

.3 Surety must agree, in writing, to each request for payment.

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

Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance (naming the Owner as insured) and transportation to the site for those materials and equipment stored off the site. Under no circumstances will the Owner reimburse the Contractor for down payments, deposits, or other advance payments for materials or equipment.

§ 9.6 PROGRESS PAYMENTS

*Delete **§ 9.6.1** in its entirety and replace it with the following:*

§ 9.6.1 After the Architect has issued a Certificate for Payment; the Owner shall make progress payments in accordance with the following subparagraph that shall be inserted as Article 5, Progress Payments, in the Owner-Contractor Agreement, AIA Document A101, 2007 Edition.

Based upon the applications for payment and supporting documents submitted to the Architect by the Contractor and certification of the amount payable by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents for the period ending the last day of the month as follows:

.1 Not later than twenty-five (25) days following the end of the period covered by the Application for Payment, ninety-five percent (95%) of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work and ninety-five percent (95%) of the portion of the Contract Sum properly allocable to materials and equipment suitably stored at the site or at some other location agreed upon in writing (subject to the conditions listed in Article 9.3.2 of the Supplementary Conditions to the Contract for Construction), for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner.

.2 Upon Substantial Completion of the entire Work, a sum sufficient to increase the total payments to ninety-five percent (95%) of the Contract Sum, less such amounts as the Architect shall determine for all incomplete Work and unsettled claims as provided in the Contract Documents.

§ 9.7 FAILURE OF PAYMENT

*Delete **§ 9.7** in its entirety and replace it with the following:*

§ 9.7.1 If the Owner does not pay Contractor any payment which is due and owing under this Contract and which has been certified by the Architect and the Construction Manager within fifteen (15) days of the date when it is due, then the Contractor may, upon ten (10) additional days' written notice, stop the Work until payment of amount owing has been received. The Contract Time shall be extended appropriately, and the Contract Sum shall be increased by the amount of the Contractor's reasonable cost of shutdown, delay and start-up.

§ 9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment or credit due to Owner, or the Owner, or the Owner incurs any cost and expenses to cure any default of the Contractor or to correct defective Work, pursuant to the Contract the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to:

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

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

§ 9.8 SUBSTANTIAL COMPLETION

*Add **§ 9.8.6** and **§ 9.8.7** as follows:*

§ 9.8.6 In order for the project or a major portion thereof to be considered substantially complete, the following conditions must be met:

.1 All inspections by governmental authorities having jurisdiction over the project must have been finalized, any remedial work required by those authorities must have been completed, and Certificates of Occupancy and similar governmental approval forms must have been issued and copies delivered to the Owner and Architect.

.2 All work, both interior and exterior, shall have been completed and cleaned except minor items which if completed after occupancy, will not, in the Owner's opinion, cause interference to the Owner's use of the building or any portion thereof. A significantly large number of items to be completed or corrected will preclude the Architect from issuing a Certificate of Substantial Completion. The Owner and Architect will be the sole judge of what constitutes a significantly large number of items.

§ 9.8.7 After the date of Substantial Completion of the Project is evidenced by the Certificate of Substantial Completion, the Contractor will be allowed a period of thirty (30) days, unless extended by mutual agreement or provision of the Contract, within which to correct all deficiencies attached to the Certificate of Substantial Completion. Failure of the Contractor to complete such corrections within the stipulated time will be reported to the Contractor's surety. In this report, the Contractor and surety will be informed that, should correction remain incomplete for fifteen (15) days, the Owner may initiate action to complete corrective work out of the remaining Contract funds in accordance with Article 14.2.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

*Delete the last two sentences of **§ 9.10.2** and add the following sentence:*

Prior to final payment, the Contractor shall meet all of the requirements of Section 01 77 00, Closeout Procedures.

*Add **§ 9.10.6** as follows:*

§ 9.10.6 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner, to the Contractor, thirty-one (31) days after Substantial Completion of the work unless otherwise stipulated in the Certificate of Substantial Completion, provided the Work has been completed, the Contract fully performed, all of the requirements of Section 01 77 00, Closeout Procedures, are met, and the Final Certificate for Payment has been issued by the Architect. The final payment will not be made until all of these conditions are met.

ARTICLE 10 -- PROTECTION OF PERSONS AND PROPERTY

*Add **§ 10.2.9** and **§ 10.2.10** as follows:*

§ 10.2.9 The performance of the foregoing services by the Contractor shall not relieve the Subcontractors of their responsibilities for the safety of persons and property and for compliance with all applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to the conduct of the Work.

§ 10.2.10 The Contractor shall be responsible for taking all precautions necessary to protect the Work in place from any foreseeable weather conditions which could cause any potential damage to portions or all Work in place. The Contractor shall be responsible for performing all repairs and/or replacement of any Work that results from foreseeable weather conditions.

§ 10.3 HAZARDOUS MATERIALS

*Delete the text of **§ 10.3.1** in its entirety and substitute the following:*

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in section 10.3.2.

*Delete the text of **§ 10.3.3, § 10.3.4** and **§ 10.3.5** in their entirety. Delete*

*the text of **§ 10.3.6** in its entirety and substitute the following:*

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a governmental agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all costs and expenses thereby incurred, but only to the extent provided by law.

*Add **§ 10.3.7** as follows:*

§ 10.3.7 As part of the construction contract close out process, and prior to receiving payment of any of the retainage, the Contractor, its subcontractors, and each subcontractor's subcontractors shall submit notarized statements pertaining to hazardous materials. Refer to Section 01 77 00, Close Out Procedures.

ARTICLE 11 -- INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

*At **§ 11.1.1**, add the following Subparagraphs:*

.9 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- **.1** Premises Operations (including X, C, and U coverage's)
- **.2** Independent Contractors'
- **.3** Products and Completed Operations
- **.4** Personal Injury Liability with Employee Exclusion deleted
- **.5** Contractual, including specified provision for Contractor's obligation under Paragraph 3.18
- **.6** Owned, non-owned and hired vehicles
- **.7** Broad Form Property Damage including Completed Operations

.8 All insurance coverages shall be issued on an Occurrence basis and must be maintained for one year following substantial completion

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

*Delete the text of **§ 11.1.2** in its entirety and replace it with the following:*

§ 11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits or the limits required by law, whichever coverage is greater:

.1 Workers' Compensation:
- (a) State: Texas - Statutory
- (b) Applicable Federal - Statutory
- (c) Employer's Liability
  $1,000,000 per Accident
  $1,000,000 per Disease, Policy Limit
  $1,000,000 per Disease, Each Employee

.2 Commercial General Liability Insurance

(a)	General Aggregate	$1,000,000
(b)	Products / Completed Operations Agg	$1,000,000
(c)	Personal and Advertising Injury	$1,000,000
(d)	Each Occurrence	$1,000,000
(e)	Fire Damage	$500,000
(f)	Medical Expense	$5,000

.3 Contractual Liability:
- (a) Bodily Injury and Property Damage Combined:
  $1,000,000 Each Occurrence
  $1,000,000 Aggregate

.4 Personal Injury, with Employee Exclusion deleted:
$1,000,000 Each Occurrence
$1,000,000 Aggregate

.5 Business Auto Liability (including owned, non-owned and hired vehicles):

(a)	Combined Single Limit	$1,000,000

OR

(b)	Bodily Injury (per person)	$500,000
(c)	Bodily Injury (per accident)	$1,000,000
(d)	Property Damage (per accident)	$500,000

.6 Umbrella Liability Insurance:
- (a) One time contract amount for all contracts exceeding $100,000, up to $5,000,000 total limit.
- (b) The Umbrella shall provide coverage over the workmen's compensation, comprehensive general liability, and comprehensive automobile liability. The Owner and the Architect and all Consultants listed on the Title Page of the Project Manual shall be an additional insured on the Contractor's policy as to the subject job. Provision shall be included for Waiver of Subrogation against Owner and Architect and his Consultants.

*At **§ 11.1.3**, add the following:*

Proof of insurance shall be evidenced on an ACORD Certificate of Insurance. Policy exclusions and/or restrictions should be clearly explained on the Certificate or in an attached letter from the issuing agency. Blank areas on the Certificate should have "not covered" written across the printed areas when coverage is not provided. Copies of the following endorsements or their equivalents, specifically naming the District:

.1 60 day notice non-renewal, cancellation or material change to any of the policies; CG 01 05, TE 02 02A and WC 42 06 01,

.2 "Additional Insured" on the Property, General Liability, Automobile Liability and Umbrella (Excess) Liability policies: naming the District; CG 20 10, CG 20 37, CA 04 03,

.3 "Waitver of Subrogation" clause in favor of the District will be attached to the Workers Compensation, General Liability, Automobile Liability, Umbrella Liability and the Property insurance policies; CG 24 04, TE 20 46A, WC 42 03 04A.

*Delete the text of **§ 11.1.4** in its entirety.*

§ 11.3.7 WAIVERS OF SUBROGATION

*Delete **§ 11.3.7** in its entirety*

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

*Add **§ 11.4.3**, **§ 11.4.4**, and **§ 11.4.5** as follows:*

§ 11.4.3 The Performance Bond Form and The Payment Bond Form included herein shall be executed and submitted to the Architect in duplicate prior to commencement of the work. The surety companies must be acceptable to the Owner and licensed admitted carriers in the State of Texas; and the companies must appear in a current Federal Treasury list as Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies.

§ 11.4.4 Each bond shall be of penal sum equal to 100% of the Contract Sum and shall be compatible with the provisions of the governing authority. The Contractor shall file copies of each bond with the county clerk and furnish the Owner with a file receipt. The bonds shall remain in force throughout the warranty period of the contract. The work will not be started until the bonds and issuing companies have been accepted as satisfactory by the Owner. The original bonds will be delivered to the Owner with an authorized power of attorney attached.

§ 11.4.5 Claims must be sent to the Contractor and his Surety in accordance with Chapter 2253 of the Texas Government Code. The Owner will furnish in accordance with such Article, a copy of the Payment Bond as provided therein to claimants upon request. All claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his Surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.

ARTICLE 13 -- MISCELLANEOUS PROVISIONS

§ 13.3 WRITTEN NOTICE

*Delete the text of **§ 13.3** in its entirety and substitute the following:*

§ 13.3 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer at the corporation for which is was intended, or if delivered at or sent by certified mail, or by registered or certified mail, or by courier service providing proof of delivery, to the last business address known to the party giving notice, or if delivered by facsimile or other electronic communications to the offices of the person or corporation for which it was intended. For facsimiles or other electronic communications received after 5:00 p.m. on a business day, or on a weekend or legal holiday on which the recipient's offices are closed, notice shall be deemed to have been duly served on the next business day.

§ 13.7 TIME LIMITS ON CLAIMS

*Delete the last sentence of **§ 13.7** in its entirety.*

*Add **§ 13.8** and **§ 13.9** as follows:*

§ 13.8 EQUAL OPPORTUNITY

§ 13.8.1 The Contractor shall maintain policies of employment as follows:

.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

§ 13.9 CRIMINAL BACKGROUND CHECKS

§ 13.9.1 Contractor must certify on forms provided by the District and found in Sections 00 62 09,1 and 00 62 09.2 of the Project Manual, that for each employee of Contractor who (1) will have direct contact with students (substantial opportunity for verbal or physical interaction with students that is not supervised by a certified educator or other professional District employee), and (2) will have continuing duties related to the Project, the Contractor has obtained, as required by Texas Education Code Section 22.0834 and Texas Administrative Code Section 153.1101 and 153.1117:

(a) national criminal history record information from a law enforcement or criminal justice agency for each employee of Proposed hired before January 1, 2008; and

(b) national criminal history record information from the Texas Department of public Safety for each employee of Proposer hired on or after January 2, 2008.

Contractor will also be required to obtain from each and every subcontractor or independent contractor the form of certification, relating to the employees of such subcontractors and independent contractors. All Contractor and Subcontractor forms must be submitted prior to the commencement of work by the Contractor or the applicable subcontractor/independent contractor, who will have direct contact with students, must not have been convicted of an offense identified in Texas Education Code Section 22.085, or any higher standard established by the Owner.

ARTICLE 14 -- TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

*Delete the text of **§ 14.4.3** in its entirety and substitute the following:*

§ 14.4.3 In the case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed up to date of receipt of the notice of termination.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

*Delete the text of **§ 15.1.1** in its entirety and substitute the following:*

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner, Architect, and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

*Delete the second sentence of **§ 15.1.2** in its entirety and substitute the following:*

Claims by either party must be initiated within ninety (90) days after occurrence of the event giving rise to such Claim or within ninety (90) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

*Delete the text of **§ 15.1.5.2** in its entirety and substitute the following:*

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented and listed in accordance with Article 8.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

*Delete the text of **§ 15.1.6** in its entirety.*

§ 15.2 INITIAL DECISION

*Delete the text of **§ 15.2.1** in its entirety and substitute the following:*

§ 15.2.1 Claims, excluding those arising under Sections **11.3.9** and **11.3.10**, including those alleging an error or omission by the Architect, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. If the parties are unable to agree, any claim, dispute or matters arising out of the contract between the Architect, Owner and Contractor or any combination of those parties shall be submitted to a court of appropriate jurisdiction.

*Delete the text of **§ 15.2.5** in its entirety and substitute the following:*

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefore; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or contract Time or both. The initial decision shall be final and binding on the parties, but subject to mediation, if both parties so agree, and subject to legal or equitable proceedings in a court having jurisdiction thereof. It is understood and agreed that, in the event that any dispute, controversy, or conflict arises during the design and construction of the Project or following its completion, the parties hereto will cooperate in good faith, if possible, to resolve the issues without resorting to litigation.

*Delete the text of **§ 15.2.6** and **§ 15.2.6.1** in their entirety. Add **§***

***15.2.9** as follows:*

§ 15.2.9 The prevailing party in any judicial proceeding arising from the Contract Documents shall recover its reasonable and necessary attorneys' fees.

§ 15.3 MEDIATION

Delete reference to "as a condition precedent to binding dispute resolution" *from the text of* ***§ 15.3.1****.*

Delete the text of ***§ 15.3.2*** *in its entirety and replace with the following:*

§ 15.3.2 The parties shall endeavor to resolve their claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract. Mediation shall proceed in advance of legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing unless stayed for a longer period of agreement of the parties or court order.

§ 15.4 ARBITRATION

Delete the text of ***§ 15.4.1*** *through* ***§ 15.4.3*** *and* ***§ 15.4.4.1*** *through* ***§ 15.4.4.3*** *in their entirety.*

These Supplementary Conditions are entered into as of the date indicated on the AIA Standard Form of Agreement.

OWNER (Signature)	*CONTRACTOR (Signature)*
(Printed Name and Title)	*(Printed Name and Title)*

ACKNOWLEDGMENT

This acknowledges that I have reviewed all asbestos management plans and/or surveys on file with the Owner prior to commencing the Work, and that I have reviewed and agree to follow the rules, procedures, and instructions contained within Article 10.3 of the A201-2007 General Conditions and Supplementary Conditions. I further understand and agree that I will be responsible for notifying all of my employees, agents, representatives, and subcontractors of the Owner's asbestos management plans and surveys and of the rules, procedures, instructions, and adhere to all training requirements contained within Article 10.3 of the A201-2007 General Conditions and Supplementary Conditions.

_____

Company Name

_____

Person Responsible

END OF DOCUMENT 00 73 00

Document 00 73 43

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 1, 2022

Texas Gulf Coast Area

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

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

Prevailing Wage Rates

Worker Classification Definition Sheet

CLASSIFICATION	DEFINITION
ASBESTOS WORKER	Worker who removes and disposes of asbestos materials.
BRICKLAYER; MASON	Craftsman who works with masonry products, stone, brick, block, or any material substituting those materials and accessories.
CARPENTER; CASEWORKER	Worker who build wood structures or structures of any material which has replaces wood. Includes rough and finish carpentry, hardware and trim.
CARPET LAYER; FLOOR INSTALLER	Worker who installs carpets and /or floor coverings, vinyl tile.
CONCRETE FINISHER	Worker who floats, trowels, and finishes concrete.
DATA COMM/TELE COMM	Worker who installs data/telephone and television cable and associate equipment and accessories.
DRYWALL; CEILING INSTALLER	Worker who installs metal framed walls and ceiling, drywall coverings, ceiling grids, and ceilings.
ELECTRICIAN	Skilled craftsman who installs or repairs electrical wiring and devices. Includes fire alarm systems and HVAC electrical controls.
ELEVATOR MECHANIC	Craftsman skilled in the installation and maintenance of elevators.
FIREPROOFING INSTALLER	Worker who sprays or applies fire proofing materials.
GLAZIER	Worker who installs glass, glazing, and glass framing.
HEAVY EQUIPMENT OPERATOR	Includes but not limited to: all CAT tractors, all derrick-powered, all power operated cranes, back-hoes, back-fillers, power operated shovels, winch trucks, and all trenching machines.
INSULATOR	Worker who applies, sprays, or installs insulation.
IRONWORKER	Skilled craftsman who erects structural steel framing, and installs structural concrete Rebar.
LABORER, HELPER	Worker qualified for only unskilled or semi-skilled work. Lifting, carrying materials or tools, hauling, digging, clean up.
LATHERER; PLASTERER	Worker who installs metal framing and lath. Worker who applies plaster to lathing and installs associated accessories.
LIGHT EQUIPMENT OPERATOR	Includes but not limited to , air compressors, truck crane drivers, flex planes, building elevators, form graders, concrete mixers less than 14cf), conveyers.
METAL BUILDING ASSEMBLER	Worker who assembles pre-made metal buildings.
MILLWRIGHT	Mechanic specializing in the installation of heavy machinery, conveyance, wrenches, dock levelers, hydraulic lifts, and align pumps.
PAINTER; WALL COVERING INSTALLER	Worker who prepares wall surfaces and applies paint and/or 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.

SECTION 01 11 00
SUMMARY OF WORK

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. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SUMMARY

A. Section includes project information, work covered by Contract Documents, work under separate contracts, access to site, coordination with occupants, work restrictions, and specification and drawing conventions.

B. Related Requirements:
   1. Section 01 21 00, Allowances
   2. Section 01 31 00, Project Management and Coordination
   3. Section 01 50 00, Temporary Facilities and Controls

1.3 PROJECT INFORMATION

A. Project Identification: 2022 – Bond Program New Williams Elementary School Replacement Project

B. Project Location: Allen-Genoa and Queens Street
   1. Williams Elementary School

C. Owner:
   Pasadena Independent School District
   3920 Mickey Gilley Blvd
   Pasadena, Texas 77505
   Telephone: (713) 740-0000
   Fax: (713) 740-4015

D. Architect:
   Texas-IBI Group, Inc.
   PO Box 891209
   Houston, Texas 77289
   Telephone: (281) 286-6605

E. Architect's Consultants: The Architect has retained the design professionals listed below to prepare designated portions of the Contract Documents.
   1. **Civil Engineer:**
      S&G Engineering Consultants, LLC
      1796 Avenue D, Suite B
      Katy, Texas 77493
      Telephone: (832) 437-7377

2. **Structural Engineer:**
   CJG Engineers
   6051 North Course Drive, Suite 375
   Houston, Texas 77072
   Telephone: (713) 780-3345

3. **MEP Engineer:**
   LTY Engineering PLLC
   840 Gessner Road, Suite 325
   Houston, Texas 77024
   Telephone: (281) 945-8888

4. **Technology:**
   True North Consulting Group
   2000 W Loop S, Ste. 1340
   Houston, Texas 77027
   Telephone: (888) 650-4580

5. **Landscaping:**
   Mary Goldsby
   112 Northwood Street
   Houston, Texas 77009
   Telephone: (713) 802-2799

6. **Traffic Study:**
   Qualls Design
   10207 Birchline Dr.
   Spring, Texas 77379
   Telephone (713) 398-7461

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consist of the construction of a new elementary school for Pasadena Independent School buildings.
   1. Reference each project plan to determine exact extent of scope of work.
   2. Construction site staging will be coordinated with Contractor, Owner and Architect prior to start of work.

B. Type of Contract: The Project will be constructed under a single prime contract.

1.5 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Provide site access, space, scheduling, scheduling coordination, coordination of work forces, and coordination of technical requirements with contractors that may be selected and employed by the Owner to perform work simultaneously and in conjunction with the Work. The Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. None.

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site, except as indicated on the drawings, for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to areas permitted by law, ordinances, permits, and the Contract Documents.

1.7 COORDINATION WITH OCCUPANTS

A. The Owner may utilize the existing improvements **if any, where applicable and as indicated on the drawings**. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
   1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
   3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
   4. Before limited Owner occupancy, all emergency and life safety systems shall be fully operational and required tests and inspections shall be successfully completed. Emergency and life safety systems include, but are not limited to, fire sprinkler systems, fire alarm systems, and emergency egress devices. For emergency exiting purposes, the path of travel shall be clearly delineated, free of obstructions, and functional. Temporary barricades shall separate construction activities from occupied spaces as allowed by authorities having jurisdiction. On occupancy, Owner will operate and maintain emergency and life safety systems serving occupied portions of Work. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Architect and Owner not less than 48 hours in advance of proposed utility interruptions.

2. Obtain Architect and Owner's written permission before proceeding with utility interruptions.

C. Controlled Substances: Use of tobacco products, alcoholic beverages, and other controlled substances is not permitted in the building or on the Project site.

D. Employee Screening: Comply with Owner's requirements for background screening of Contractor personnel working on Project site.
   1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing notes found on Drawings.

2 PRODUCTS (NOT USED)

3 EXECUTION (NOT USED)

END OF SECTION 01 11 00

SECTION 01 11 26

OWNER-PROVIDED DOCUMENTS

CONDITIONS OF THE CONTRACT, DIVISION 0 and DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

1.2 COPIES OF SUPPLEMENTARY CONTRACT DOCUMENTS

A. The following Owner-provided Documents are hereby designated as Supplementary Contract Documents.
   01 Geotechnical Investigation Report(s) – Refer to section 02 32 00
      a. Entitled: Williams Elementary School Replacement Geotechnical Engineering Report
      b. Prepared by: Terracon Consultants, Inc.
      c. Terracon Project No.: 91235141
      d. Dated: March 22, 2024
      e. Pages: 63 pages
   02 Boundary and Topographical Survey – Bound in Drawing set
      a. Entitled: Queens Intermediate Softball Fields out of the J. Webster Survey Abstract no. 865 J.H. Burnett Survey Abstract No. 1142 T. Meaux Survey Abstract no. 597 Harris County, Texas
      b. Prepared by: West Belt Surveying, Inc.
      c. West Belt Project No.: S727-0087B
      d. Dated: July 3, 2023
      e. Drawing / Sheet No.: C002 through C005

B. Any of the above documents bound in the Drawings or Specifications are included for reference purposes only.

C. The Architect does not guarantee their contents as to accuracy, completeness, or suitability.

D. Copies may be examined at the Architect's office.

1.3 COPIES OF DOCUMENTS FOR CONSTRUCTION

A. The Contract Documents that are part of the Owner-Contractor Agreement consist of the Proposal Drawings, Proposal Specifications and Addenda issued prior to execution of the Agreement.
   01 The Contractor will be furnished free of charge, five (5) copies of the Contract Documents for execution of the Work.
   02 Upon written request by the Contractor, provisions for additional sets shall be made; however, the Contractor shall pay actual reproduction costs of any additional copies required or requested by the Contractor.

B. As a matter of practice, Texas-Arcadis assembles a Posted Set of Drawings and Specification which include all revisions issued by addenda.

END OF SECTION

SECTION 01 12 00

MULTIPLE CONTRACT SUMMARY

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Project consists of the following:
   01 Work performed by the Contractor for scope included in the Owner-Contractor Agreement.
   02 Work performed by Owner's separate Contractor / Consultant.

B. The Scope of Work performed by the Contractor and Owner's separate Contractor, as well as the schedules for both, will overlap and / or interface with each other. This Specification describes the responsibilities of the Contractor as it relates to the accommodation, implementation and execution of work performed by Owner's separate Contractor.

1.2 PROJECT SCOPE INFORMATION

A. Contractor's Scope of Work: Unless clearly identified as Work by Owner's separate Contractor, noted not in contract (NIC), or identified as Work by Others, the Contractor shall provide the following:
   01 All base proposal work shown or identified on the Drawings.
   02 All alternate proposal work shown or identified on the Drawings.
   03 All base proposal work described in the Specifications.
   04 All alternate proposal work described in the Specification.

B. Owner's Separate Contractor Scope of Work: The following Work shall be performed by Owner's separate Contractor:
   01 Surveying
   02 Geotechnical Investigation
   03 Material Testing
   04 Commissioning

1.3 PROJECT COORDINATION

A. Contractor's Coordination:
   01 Contractor shall be required to coordinate construction schedules and critical path items and sequencing of installation of Scope of Work performed by Owner's separate Contractor / Consultant as it relates to or affects the interface, overlap and execution of the Scope of Work in this Contract.
   02 Contractor shall be required to coordinate logistics of the Owner's separate Contractor / Consultant in such a manner that facilitates all the Work performed on site, including, but not limited to:
      a. Product delivery
      b. Staging
      c. Laydown and work areas
      d. Equipment access and traffic.
      e. Temporary facilities.
   03 Any Contractor expense required to coordinate with Owner's separate Contractor shall be included in the Contractor's Base Proposal and / or Alternate Proposals as applicable.

B. Owner's Separate Contractor Coordination:
   01 The Owner's separate Contractors / Consultants shall be required to coordinate and implement all aspects of their separate scope of work.
   02 The Owner's separate Contractor / Consultants shall cooperate with the Contractor as required for proper interface with the Contractor's / Consultant's scope of work.

1.4 CONTRACTOR'S USE OF THE SITE

A. Contractor's Use of the Site:
   01 Confine operations at site to areas permitted by law, permits, and Contract Documents, or as required to maintain campus operations as approved by Owner and do not interfere with, or access to, the area designated for work by Owner's separate Contractor / Consultant except when authorized by that entity performing the separate work.
   02 Do not unreasonably encumber site with materials or equipment. Refer to Contractor lay-down areas indicated on Plans. If not indicated on Plans provided, Contractor to submit to the Architect for approval of all proposed Contractor designated areas, including but not limited to: lay-down, staging, parking, restroom, trailer, dumpster, field office, etc.
   03 Contractor shall establish secured staging area for Work and coordinate and provide for safe passage and exit from existing site and building areas during construction, in compliance with all applicable codes and requirements of Owner and shall coordinate access points and pathways with Owner's separate Contractor / Consultants performing the respective scope of their work.
   04 During phased construction, Contractor shall provide maps of building to Owner for each phase, showing construction area and impact to other areas of the building.
   05 Contractor shall coordinate all on-site construction activities with school district officials and Architect prior to commencement of Work.
   06 Noise Control: Contractor shall coordinate equipment locations and timing of work activities so as to avoid conflict with the building occupants and / or avoid interference with facility meetings, events or other activities.
   07 Utilities. The Contractor shall coordinate all permanent and temporary utilities and coordinate tie-ins and utility disruptions with Owner's separate Contractor's Scope of Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Specification Sections.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE

A. General Description of Coordination of Work to Be Performed Under This Contract:
   01 Contractor shall attend regularly weekly scheduled Owner / Architect / Contractor meetings with Owner's separate Contractor / Consultant.
   02 Those Contractors in attendance shall actively collaborate for coordinating all work activities on site the coming weeks and longer-term activities that could impact scope of work by any Contractor performing Work on the campus.

03 Contractors in attendance will endeavor to resolve coordination issues and access to work areas in or adjacent to each other's Scope of Work and Owner / Architect shall act as mediator for any unresolved coordination issues.

END OF SECTION

SECTION 01 21 00

ALLOWANCES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. The following ALLOWANCES shall be included in the Base Proposal. These sums shall be reconciled per Article 3.8 of the General Conditions.

1.2 CONDITIONS

A. The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. These allowances shall cover the net cost of the materials and equipment delivered and unloaded at the site, and all applicable taxes.

01 The Contractor's handling costs on site, labor, installation, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contractor's Base Proposal sum, and not in the allowance.

02 The Contractor shall cause the Work covered by these allowances to be performed for such amounts and by such persons as the Architect may direct, but he will not be required to employ persons against whom he makes reasonable objection.

03 If the cost, when determined, is more than the allowance, the Owner shall have the option of:

a. Supplementing funds in one allowance from another allowance to provide adequate funding;

b. Adjusting the Contract sum accordingly by Change Order, which will include Contractor’s overhead, profit and other expenses resulting to the Contractor.

B. Unexpended balance of allowance sums shall revert to the Owner in the final settlement Change Order of the Contract.

PART 2 - ALLOWANCES

2.1 ITEMS

A. Owner Contingency:

Contractor shall include in the Base Proposal the following sums as a contingency to cover the cost of hidden, concealed or otherwise unforeseen conditions which develop during completion of the Work. Contractor shall proceed with the Work in question only after receiving written directions executed by the Owner and the Architect. Owner will not be obligated to pay the cost of any work performed without prior written authorization. The Contractor's overhead and profit relative to this contingency sum and work performed in accordance herewith, shall be included in the total Base Proposal price, but not included in the contingency sum. Unexpended balance of contingency sums shall revert to the Owner in the final settlement of the Contract.

Additional contingency work to include following Technology upgrades:

01 To include options for the owner to update equipment established in the base bid due to discontinuation or evolution of technology products, including the following:
   a. Campus Security Devices
      1. Video Surveillance Manager and Cameras
   b. Campus A/V Multimedia Devices
      1. Digital Signage Flat Panel Display Systems
      2. Menu Board Signage Systems
      3. Conference Room Interactive promethium boards
      4. Large Venue Projectors
   c. Intrusion Systems
   d. Access Control
   e. Fire Alarm

02 Material and Labor Allowances
   a. 7 Tons miscellaneous Steel Allowance
   b. Supergraphics Allowance
   c. Graphic Allowance
   d. Emergency Radio DAS System

Allow the sum of $1,625,000.00

END OF SECTION

SECTION 01 22 00

UNIT PRICES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Contractor shall state, in the spaces provided in the Proposal Form, unit prices for the Work described below.
   02 The same unit price for each item shall be used for both adding or deleting the described work if / as directed by the Architect during the progress of the Work.
   03 Costs declared for Unit Prices shall be the gross amount used for adjustment, based on the actual quantity of units directed to be adjusted.

PART 2 – DESCRIPTION OF UNIT PRICES

2.1 GENERAL

A. For the Work described, unit pricing shall be used to determine the additional cost or credit to the Contract amount, or added to or deducted from the Owner's Contingency for changes in the Scope of Work made during the progress of the Work as directed by the Architect.

B. The same price shall be used for adding or deducting from the Scope of Work. No Exceptions.

C. The following unit prices shall be included on the proposal form and shall be included in the Owner - Contractor Agreement.

2.2 UNIT PRICES – SITE CONCRETE

A. Provide unit pricing for the following site concrete work, including subgrade prep:

01	Add / Delete 60" Wide Sidewalks	_____ Lin. Foot (LF)
02	Add / Delete Non-Traffic Concrete Flatwork	_____ Sq. Foot (SF)
03	Add / Delete Medium Duty (5") Concrete Paving	_____ Sq. Foot (SF)
04	Add / Delete Heavy Duty (7") Concrete Paving	_____ Sq. Foot (SF)
05	Add / Delete 6" Concrete Curb	_____ Lin. Foot (LF)

2.3 UNIT PRICES – STRAIGHT SHAFT PIERS

A. Provide unit pricing for the following straight shaft drilled piers in lieu of bell bottom piers:

01	Add / Delete 20" diameter pier	_____ Each (EA)
02	Add / Delete 24" diameter pier	_____ Each (EA)
03	Add / Delete 30" diameter pier	_____ Each (EA)
04	Add / Delete 36" diameter pier	_____ Each (EA)

2.4 UNIT PRICES – ELECTRICAL

A. Provide unit pricing for the following electrical work:

01	Add / Delete 120V duplex receptacle on nearest capable circuit	_____ Each (EA)
02	Add / Delete 120V duplex receptacle on dedicated circuit, including 20 amp circuit breaker	_____ Each (EA)
03	Add / Delete 220V receptacle on dedicated circuit including 20 amp circuit breaker	_____ Each (EA)
04	Add / Delete two-way light switch	_____ Each (EA)
05	Add / Delete three-way light switch	_____ Each (EA)

2.5 UNIT PRICES – TECHNOLOGY

A. Provide unit pricing for the following technology work:

01	Add / Delete a single data port wired to nearest IDF / MDF room	_____ Each (EA)
02	Add / Delete double data port wired to nearest IDF / MDF room	_____ Each (EA)
03	Add / Delete triple data port wired to nearest IDF / MDF room	_____ Each (EA)
04	Add / Delete j-box with 1-1/4” conduit stubbed Up wall to above ceiling	_____ Each (EA)

2.6 UNIT PRICES – DOORS AND FRAMES

A. Provide unit pricing for the following door and frame work:

01	Add / Delete interior 3070 SCPL, full flush door prepped for hardware	_____ Each (EA)
02	Add / Delete interior 3070 HM full flush door and HM frame, including painting	_____ Each (EA)
	Add / Delete interior 3070 aluminum door frame	_____ Each (EA)
03	Add / Delete exterior 31070 HM full flush door and HM frame, including painting	_____ Each (EA)
04	Add / Delete Nominal 8” x 31” door lite	_____ Each (EA)

END OF SECTION

PSECTION 01 23 00

ALTERNATES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 The Contract Documents contain certain scopes of Work to be identified and priced separately by the Contractor.
   02 Alternate proposals are not included in the Contractors Base Proposal amount.
   03 Alternate proposals may be additive or deductive as determined by the Contractor.
   04 Acceptance or rejection of each Alternate shall be at the Owner's sole discretion.

1.2 ALTERNATE PRICES

A. Contractor shall state, in the spaces provided in the Proposal Form, alternate prices for the work described in the Alternate.
   01 Proposer's pricing for Alternates shall be the net change to the Base Proposal amount to include the cost of all supporting elements required to implement the described Alternate Scope of Work.
   02 Work for all Alternates shall be in strict accordance with the Specification and applicable work as indicated on the Drawings.

B. Unless otherwise indicated, Scope of Work for each Alternate shall include material and labor, general conditions and all other costs, as applicable, associated with completing the Work described.

C. Alternates are not listed in the order of priority.

D. Acceptance of Alternates and inclusion in the Owner-Contractor Agreement shall be at the sole discretion of the Owner.
   01 Proposed pricing of Alternate Proposals shall be such that no matter what combination of Base Proposal and Alternates are accepted, the corresponding Contract amount shall be the total sum required to provide the full and defined Scope of Work.

1.3 HVAC CHILLERS

A. HVAC Chillers shall not be included to the Base Proposal.

B. HVAC Chillers are fully described in the Drawings and Specifications; and shall be the basis for pricing the alternate proposals.

C. Alternate Proposals regarding HVAC Chillers shall provide the Owner the means to determine the manufacturer / provider that represents the best value to the District.

D. The Owner-Contractor Agreement amount shall include acceptance of this Alternate.

1.4 BUILDING MANAGEMENT CONTROL SYSTEM

A. Building Management Control System shall not be included to the Base Proposal.

B. Building Management Control System are fully described in the Drawings and Specifications; and shall be the basis for pricing the alternate proposals.

C. Alternate Proposals regarding Building Management Control System shall provide the Owner the means to determine the manufacturer / provider that represents the best value to the District.

D. The Owner-Contractor Agreement amount shall include acceptance of this Alternate.

PART 2 - PRODUCTS

2.1 DESCRIPTION OF ALTERNATE PROPOSALS

A. ALTERNATE NO. 1 – AIR COOLED CHILLERS – DAIKIN
   01 This alternate shall establish the amount the Base Bid is increased depending on which chillers are provided. There is no chiller provided in the base bid.

B. ALTERNATE NO. 2 – AIR COOLED CHILLERS – TRANE
   01 This alternate shall establish the amount the Base Bid is increased depending on which chillers are provided. There are not chillers provided in the base bid.

C. ALTERNATE NO. 3. – AIR COOLED CHILLERS – CARRIER
   01 This alternate shall establish the amount the Base Bid is increased depending on which chillers are provided. There are not chillers provided in the base bid.

D. ALTERNATE NO. 4 – BCMS – UNIFY
   01 This alternate shall establish the amount the Base Bid is increased depending on which Building Control Monitoring System (BCMS) is provided. There is not BCMS provided in the base bid. GC should provide pricing for each system shown in Alternates 1, 3, and 5 as indicated below:
      a. Alternate 4A: BCMS – Daikin/Unify
      b. Alternate 4B: BCMS – Trance/Unify
      c. Alternate 4C BCMS – Carrier/Unify

E. ALTERNATE NO. 5 – BCMS – ALC
   01 This alternate shall establish the amount the Base Bid is increased depending on which Building Control Monitoring System (BCMS) is provided. There is no BCMS provided in the Base Bid. GC Should provide pricing for each system shown in Alternates 1, 3, and 5 as indicated below:
      a. Alternate 5A: BCMS – Daikin/ALC
      b. Alternate 5B: BCMS – Trane/ALC
      c. Alternate 5C BCMS – Carrier/ALC

F. ALTERNATE NO. 6 – BASE BID CORRECTION
   01 This alternate shall establish the amount the Base Bid is changed from the Base Proposal Amount indicated on Document 00 42 13.13 Bid Proposal Form-Part One. The correction is made solely at the discretion of the Proposer to adjust the Base Proposal amount submitted prior to submittal of Alternate proposals. There is no scope associated with this Alternate.

END OF SECTION

SECTION 01 25 00

REQUEST FOR SUBSTITUTION PROCEDURES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Each Specification Section includes products, materials and / or equipment incorporated into the Scope of Work as the “Basis of Design”, as well as listed other acceptable manufacturers / providers.
   02 Substitutions Prior To Award of Contract: Procedures and required documentation for a request for substitution of products, materials and / or equipment from those required by the Contract Documents.
   03 Substitutions After Award of Contract: Procedures and required documentation for a request for substitution of products, materials and / or equipment from those required by the Contract Documents.
      a. The Scope of Work is based products, materials and equipment used for the Basis of Design which the Owner has approved.
      b. Except for other provisions included in the Contract, in order to receive due consideration, requests for substitution after award of Contract should be accompanied with incentive – financial or schedule – to the Owner for accepting the substitution.
   04 No consideration will be given to requests for substitution for products, materials and / or equipment that is described as “no substitutions”.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. In order for a request for substitution to be considered, submit the following to the Architect as a single, concise complete package.
   01 Incomplete, vague or ambiguous packages will not be considered and result in the request being denied.

C. Substitution Request Form (attached at end of this Section)
   01 Two forms are attached at the end of this Specification Section:
      a. Substitution Request Form – Pre-Contract Award
      b. Substitution Request form – Post-Contract Award
   02 Submit the appropriate form, fully executed.

D. Specification Section: Return the complete Specification Section with the following:
   01 Each and every paragraph, statement and description clearly initialed to signify the proposed substitution will meet or exceed the specified requirement.
   02 For any of the proposed substitution deviation of any requirement or provision of the Specification, clearly describe what is proposed if the substitution is accepted.

E. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Pertinent product data must be clearly indicated; and conversely, product data that is not applicable must be clearly marked out or indicated as not applicable.
   02 Architect's review shall not include interpretation of vague or ambiguous product data.

F. Shop Drawings:
   01 Provide Shop Drawings and / or details that depict the proposed substitution as it would be incorporated into the Work.
   02 Details submitted for review shall be specific to the Work of this Contract and shall accurately depict adjacent and interfacing products / materials within the assembly(s) indicated on the Drawings.
   03 Generic details that do not accurately depict the Project's adjacent or interfacing work shall not be accepted; and result in disapproval of the requested substitution.

G. Color / Finish Samples: For substitution requests relating to finished exterior or interior products, submit the following:
   01 Provide two (2) samples of each proposed finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3", but must be large enough to convey attributes of the proposed product.
   04 For finishes that have been specifically indicated in the Contract Documents, submit proposed finish samples that match or closely approximate the specified material.
   05 For brick veneer provide each type of proposed brick to be provided in quantities sufficient to show range of color where applicable.

PART 2 – SUBSTITUTION SUBMISSION REQUIREMENTS

2.1 REQUEST FOR SUBSTITUTION – PRE-CONTRACT AWARD

A. All requests for substitution packages submitted Pre-Contract Award (during bidding / proposal phase) must be submitted to the Architect a minimum of ten (10) days prior to receipt of bids / proposals.
   01 Requests for substitution packages submitted less than ten (10) days prior to receipt of bids / proposals shall not be reviewed.

B. It is the sole responsibility of the submitter to confirm the submission is complete and accurate.
   01 Incomplete or inaccurate substitution packages may be rejected without notification to the submitter.
   02 The Architect shall have sole discretion to inform or not inform the submitter of any information missing from the substitution package.

C. In order for a substitution package to be considered, the following are required:
   01 Substitution request must be fully documented and properly submitted within the specified time.
   02 Substitutions must be completely compatible and properly interface with other portions of the Work.
   03 Substitution must provide specified warranty.

D. All substitutions approved by the Architect prior to submission of bids / proposals shall be incorporated into the Contract Documents by Addendum.

E. Substitutions not added to the Contract Documents by Addendum may be submitted by a General Contractor / Proposer as a supplemental qualification to his Base Bid / Base Proposal.
   01 Under this condition, the Base Bid / Base Proposal submitted by the General Contractor / Proposer must be based on the Contract Documents.
   02 The General Contractor / Proposer may submit a clearly stated qualification to the Base Bid / Proposal relative to the substitution for consideration.
   03 The stated qualification must include a statement of financial or project schedule incentive to the Owner in order for the qualified substitution to be considered.
   04 The stated qualification must include what impact, if any the substitution has on adjacent or interfacing work.
   05 The stated qualification must include a written statement from the General Contractor / Proposer that he has fully investigated the proposed substitution and will accept responsibility of the substitution for inclusion in the Project.

2.2 REQUEST FOR SUBSTITUTION – POST-CONTRACT AWARD

A. If allowed by the Contract or Contract Documents, requests for substitution post-Contract Award may be considered by the Architect under the following conditions:
   01 The Basis of Design product, material or equipment is no longer available.
   02 The product, material or equipment is no longer available from a listed acceptable manufacturer.
   03 The proposed substitution shall result in a financial or schedule incentive to the Owner should it be accepted.

B. Unless otherwise agreed to by the Architect, the Contractor shall allow a minimum of twenty-one (21) days for A/E review of requests for substitution Post-Contract Award.

C. It is the sole responsibility of the Contractor and submitter to confirm the submission package is complete and accurate.
   01 Incomplete or inaccurate request for substitution packages may be rejected without a completed review by the Architect.

D. In order for a substitution package to be considered, the following are required:
   01 Substitution request must be fully documented and properly submitted within the specified time.
   02 Substitutions must be completely compatible and properly interface with other portions of the Work.
   03 The substitution package must include documentation of any resultant impact to adjacent or interfacing work.

E. All substitutions approved by the Architect Post-Contract Award shall be incorporated into the Contract Documents by appropriate documentation (i.e. CPR, AEA, ASI or similar) as a matter of record.

PART 3 – REQUEST FOR SUBSTITUTION FORMS

REQUEST FOR SUBSTITUTION FORM – PRE-CONTRACT AWARD

Project Name: PISD WILLIAMS ELEMENTARY SCHOOL
Texas Arcadis Inc. Project No.: 202301
PISD Project No.: 24P-011LP

We hereby submit for your consideration this Request for Substitution for the following product, material and / or equipment included in the Contract Documents for the above Project:

Specification Section: _____ Specific Paragraph (as applicable): _____

Specification Name: _____

Specified Manufacturer: _____ Model No.: _____

Proposed Manufacturer**:** _____ Model No.: _____

All attached supporting documentation is confirmed to be complete and accurate; and in accordance with the submittal requirements of this Section.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:
1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

SUBMITTED BY:

_____ _____
Signature *Contact Phone Number*

_____ _____
Printed Name and Title *Contact Email Address*

_____
Company Name

_____ _____
Company Address *City, State and Zip Code*

REQUEST FOR SUBSTITUTION FORM – POST-CONTRACT AWARD

Project Name: PISD WILLIAMS ELEMENTARY SCHOOL
Texas Arcadis Inc. Project No.: 202301
PISD Project No.: 25P-034LP

We hereby submit for your consideration this Request for Substitution for the following product, material and / or equipment included in the Contract Documents for the above Project:

Specification Section: _____ Specific Paragraph (as applicable): _____

Specification Name: _____

Specified Manufacturer: _____ Model No.: _____

Proposed Manufacturer**:** _____ Model No.: _____

Reason for Substitution Request: _____

_____

Associated Owner Incentive: _____

All attached supporting documentation is confirmed to be complete and accurate; and in accordance with the submittal requirements of this Section.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:
1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

SUBMITTED BY:

_____ _____
Signature *Contact Phone Number*

_____ _____
Printed Name and Title *Contact Email Address*

_____
Company Name

_____ _____
Company Address *City, State and Zip Code*

CONTRACTOR:

_____ _____
Signature *Printed Name and Title*

END OF SECTION

SECTION 01 26 00

CONTRACT ADMINISTRATION DOCUMENT MANAGEMENT

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: This section describes procedures to be followed for processing the following documents:
   01 RFI – Request for Information.
   02 ASI – Architect's Supplemental Instructions.
   03 CPR – Change Proposal Request (Architect generated).
   04 PCR – Potential Change Request (Contractor generated).
   05 AEA – Allowance Expenditure Authorization.
   06 CCD – Construction Change Directive.

C. If there is a requirement for online Contract Administration, the Contractor shall utilize the Owner's Project Management Software to the extent required by the Owner.

D. Related Sections:
   01 Section 01 21 00 – Allowances
   02 Section 01 25 00 – Request for Substitution Procedures
   03 Section 01 29 76 – Progress Payment Procedures
   04 Section 01 33 00 – Submittal Procedures
   05 Section 01 77 00 – Close-Out Procedures

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. All documents included in the scope of this Section shall be processed through the Architect's document management software, Newforma, via Info Exchange.
   01 Training videos and / or live training shall be provided to the Contractor's team.
   02 Coordinate with Architect for scheduling.

C. Documents originating from the Contractor may be distributed directly to Architect's Consultants, as applicable, provided designated Architect team members are copied or included in the transmission.

D. Documents originating from the Architect shall be distributed directly to Contractor's designated team members.

E. Inclusion of Owner with respect to transmissions shall be determined at the pre-construction conference prior to commencement of Work.

F. The Contractor shall keep up-to-date logs of the documents included in the scope of this Section.
   01 Logs shall include document type, number, subject, submission date, requested response date, actual response date, cost impact, contract time impact, and status as applicable (i.e. pending, approved, not approved, voided)
   02 Contractor shall provide copies of logs to attendees at Owner-Architect-Contractor (OAC) regular meetings.

PART 2 - DOCUMENTATION

2.1 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information, clarification or interpretation of the Contract Documents, Contractor shall initially correspond with the Architect's field representative to resolve the issue.
   01 If resolution is not determined by the Architect's field representative, prepare and submit an RFI in the form specified using the Architect's electronic project document management software.
   02 Issues resolved at the Architect's Field Representative level which results in a Contractual Minor Change or Clarification shall be documented by the Architect as appropriate to the change.

B. RFI's must originate from the Contractor. Architect will not accept RFIs submitted by subcontractors or other entities controlled by Contractor.
   01 The Contractor shall endeavor to resolve subcontractor submitted RFI's directly with the subcontractor prior to submitting an RFI to the Architect.

C. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's Work or Work of subcontractors.

D. Contractor uses the RFI to request direction and / or clarification resulting from, but not limited to the following:
   01 Conflicts, omissions, ambiguities, or discrepancies within the Contract Documents.
   02 Conflicts between the Contract Documents and any provision of code or regulation applicable to the performance of the Work.
   03 Conflicts between the Contract Documents and any standard Specification or instruction of a manufacturer.
   04 Conflicts with differing existing conditions.

E. Content of RFI:
   01 Drawing sheet number reference, building area, room number and / or other specific description of the location of the issue; as appropriate.
   02 Specification Section number, page number, paragraph number and item number of the location of the issue; as appropriate.
   03 A detailed description of item needing information, clarification or interpretation.
   04 Attachments: Include sketches, descriptions, measurements, photos, product data, Shop Drawings, Coordination Drawings, and other information necessary to fully describe items needing interpretation.
   05 Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
   06 Field dimensions and / or conditions; as appropriate.
   07 Photographs of issue in question; as appropriate.
   08 Contractor's proposed / recommended resolution.
   09 Statement identifying one of the following:
      a. No Cost Impact

b. Cost Impact Unknown
c. Cost Impact Anticipated

10 Statement identifying one of the following:
a. No Contract Time Impact
b. Contract Time Impact Unknown
c. Contract Time Impact Anticipated

F. Architect's Actions:
01 Architect will review each RFI, determine action required, and respond.
02 Allow up to five (5) working days for Architect's response for each RFI. If the Contractor believes a faster response time is necessary in order to maintain schedule, it must be clearly indicated on the RFI.
03 The following RFIs will be returned without action:
a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.
04 Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
05 If Contractor believes the RFI response warrants change in the Contract Sum or the Contract Time, Contractor must notify Architect in writing within three (3) working days of receipt of the RFI response.
a. Failure of notification within the specified time frame shall be Contractor's concurrence that implementation of the Architect's response does not result in a change to Contract Sum or Contract Time.
06 Architect's action on RFIs that may result in a change to the Contract Sum or the Contract Time may be eligible for Contractor to submit Potential Change Request to the Architect for consideration.

2.2 ARCHITECT'S SUPPLEMENTAL INSTRUCTION (ASI)

A. General: ASI's are instruments initiated by the Architect and submitted to the Contractor regarding clarifications, interpretations and / or minor changes in the Work that are consistent with the Contract Documents and do not affect the Contact Sum or the Contract Time.
01 ASI's may also be used to contractually document an issue that was initially resolved on site between the Contractor's superintendent and the Architect's field representative.
02 ASI's shall be initiated and processed using the Architect's electronic project document management software.

B. Content of ASI:
01 Drawing sheet number reference, building area, room number and / or other specific description of the location of the issue; as appropriate.
02 Specification Section number, page number, paragraph number and item number of the location of the issue; as appropriate.
03 A detailed description of item needing information, clarification or interpretation.
04 Attachments: sketches, descriptions, measurements, photos, product data, Shop Drawings, Coordination Drawings, and other information necessary to fully describe items needing interpretation.
05 Dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Contractor's Action:
   01 The Contractor shall expeditiously distribute the ASI directive to all affected parties / subcontractors as required for the ASI directive to be implemented into the Work.
   02 Failure by the Contractor to expeditiously distribute the ASI directive which subsequently results in a claim for additional cost shall preclude any consideration of the claim.
   03 The Contractor shall coordinate all affected trades and make all necessary adjustments to project scope and schedule required to implement the ASI change at the appropriate time.
   04 If the Contractor fails to properly implement the ASI change at the appropriate time, all subsequent costs required to achieve proper implementation of the ASI change shall be solely at the Contractor's expense.
   05 The Contractor shall document the ASI directive on the Record Drawings kept at the site.

D. If Contractor believes the ASI directive(s) warrants change in the Contract Sum or the Contract Time, Contractor must notify Architect in writing within three (3) working days of receipt of the ASI.
   01 Failure of notification within the specified time frame shall be Contractor's concurrence that implementation of the Architect's ASI directive(s) does not result in a change to Contract Sum or Contract Time.
   02 Upon notification, one of the following shall be implemented, as agreed upon by Architect, Owner and Contractor:
      a. The Contractor shall issue a Potential Change Request (PCR) stating the proposed additional cost and / or change in contract time; or,
      b. The Architect shall convert the ASI to a Change Proposal Request (CPR) to allow the Contractor to respond; or,
      c. The Architect shall convert the ASI to a Construction Change Directive (CCD) if required for timely implementation.

2.3 CHANGE PROPOSAL REQUEST (CPR)

A. General: CPR's are instruments initiated by the Architect and submitted to the Contractor regarding changes in the Contract Documents that may result in a change in the Contact Sum or the Contract Time.
   01 CPR's may be issued for the following:
      a. Addition, deletion or modification of the scope of Work.
      b. Implementation of Owner initiated changes.
      c. Document legitimate notifications from Contactor regarding potential change in the Contract Sum or Contract Time due to Architect's response to an RFI or Architect's issuance of an ASI.
   02 CPR's shall be initiated and processed using the Architect's electronic project document management software.

B. Content of CPR:
   01 Drawing sheet number reference, building area, room number and / or other specific description of the location of the CPR subject; as appropriate.
   02 Specification Section number, page number, paragraph number and item number of the location of the CPR subject; as appropriate.
   03 A detailed description or directive of the revision of the Contract Documents.
   04 Attachments: sketches, descriptions, measurements, photos, product data, Shop Drawings, Coordination Drawings, and other supporting documentation necessary to fully describe the change in the scope of the Work.
   05 The CPR shall indicate how the CPR will be funded by the Owner.

C. Contractor's Action:
   01 The Contractor shall expeditiously distribute the CPR to all affected parties / subcontractors as required for pricing of each affected trade.
   02 Failure by the Contractor to expeditiously distribute the ASI directive which subsequently results is a claim for additional cost shall preclude any consideration of the claim.
   03 For all approved CPR's, the Contractor shall document the CPR on the Record Drawings kept at the site.

D. Contractor's CPR Response:
   01 The Contractor shall endeavor to provide CPR responses within (ten) 10 working days from receipt of the CPR.
   02 The Contractor shall provide detailed cost and / or credit documentation for all CPR's.
   03 Provide a cover letter stating the overall cost / credit impact and all adjustments to Contract Time.
   04 Responses that include a change in Contract Time must be accompanied by a detailed description of how the scope of Work in the CPR affects the critical path of the Contractor's schedule. Proposed changes in Contract Time must affect the critical path in order to be considered.
   05 Cost changes that are included in the Contract as unit prices must use the unit price amounts.
   06 Cost changes shall reflect the allowable mark-ups in accordance with the Conditions of the Contract.
   07 In addition to the cover letter, the CPR response must include the following:
      a. Detailed spreadsheet, including materials and labor, for all work proposed to be self-performed by the Contractor.
      b. A detailed breakdown, including materials and labor, from each subcontractor responding to the CPR.
   08 Prior to submission of the CPR response to the Architect for review, the Contractor shall thoroughly review all subcontractor responses and verify the following:
      a. All interpretations of scope are accurate.
      b. Unit pricing has been used where applicable in accordance with the Contract.
      c. Material take-offs are accurate.
      d. Labor units / hours are fairly assigned.
      e. Subcontractor mark-ups are in accordance with the Conditions of the Contract.
      f. Taxes have not been added where prohibited for tax-exempt projects.
   09 For CPR's to be funded by an allowance, no mark-up by the Contractor is permitted. For CPR's to be funded by Change Order, the Contractor's mark-up shall be in accordance with the Conditions of the Contract.

E. Architect's Review of CPR Response:
   01 Upon receipt of the Contractor's CPR response, the Architect shall review all documentation included in the response.
   02 Questions or request for additional information regarding the response shall be directed to the Contractor as needed. The Contractor shall promptly respond to Architect's questions or request for additional information.
   03 Upon final review, the Architect shall make recommendation to the Owner for acceptance or rejection of the CPR and related scope of work.
      a. Where the Contractor's response includes both a Contract Sum and Contract Time adjustment, the Architect may recommend acceptance of the cost and rejection of the time where the requested time extension does not affect the critical path of the project.

04 If approved / accepted by the Owner, the CPR shall be included on a future Allowance expenditure Authorization (AEA) or Change Order.

2.4 POTENTIAL CHANGE REQUEST (PCR)

A. General: PCR's are instruments initiated by the Contractor and submitted to the Architect regarding potential changes in the Contract Documents that the Contractor perceives may result in a change in the Contact Sum or the Contract Time.
   01 PCR's may be issued for the following:
      a. Architect's response to an RFI.
      b. Architect's issuance of an ASI.
      c. A/E review comments of a submittal.
      d. Contractor's anticipation of an addition, deletion or modification of the scope of Work.
      e. Potential changes initiated by the Owner and conveyed directly to the Contractor.
   02 PCR's shall be initiated and processed using the Architect's electronic project document management software.

B. Content of PCR:
   01 Content of a PCR shall generally replicate the content of an Architect's CPR (see above).
   02 The information should be detailed to a level that will allow the Architect to thoroughly analyze for further action.

C. Architect's Actions:
   01 Architect will review each PCR to determine further action required, if any, and respond.
   02 Allow up to seven (7) working days for Architect's response for each PCR. If the Contractor believes a faster response time is necessary in order to maintain schedule, it must be clearly indicated on the PCR.
   03 Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   04 If the Architect concurs the PCR warrants a change in the scope of Work that may result in a change to the Contract Sum or the Contract Time, the Architect shall issue a CPR corresponding to the scope of Work included in the Contractor's PCR; at which time the CPR will be processed as described above.

2.5 ALLOWANCE EXPENDITURE AUTHORIZATION (AEA)

A. General: AEA's are instruments initiated by the Architect and submitted to the Contractor and Owner for approval to fund CPR changes in the Contract Sum and / or changes in the Contract Time where the funding source is an Allowance included in the Contract.
   01 AEA's shall be initiated and processed using the Architect's electronic project document management software.

B. Approved expenditures to be funded by an allowance shall be documented by an AEA specific and exclusive to that particular allowance.

C. AEA's may be used to transfer funds from one allowance to another allowance.

D. Each AEA shall include attachment of all CPR expenditures or CPR credits included in the AEA.
   01 A summary of expenditures for the respective allowance shall be included in each AEA.

E. The AEA shall also include documentation of any adjustment in Contract Time which is being approved.

F. At the Owner's discretion and direction, the Contractor may proceed with approved Work included in a CPR prior to final production and execution of an AEA. Such direction to proceed with Work shall be made in writing to the Contractor for record.

G. The Contractor shall document allowance expenditures on progress applications for payment in accordance with **Section 01 29 76 – Progress Payment Procedures**.

2.6 CONSTRUCTION CHANGE DIRECTIVE (CCD)

A. General: CCD's are instruments initiated by the Architect and submitted to the Contractor and Owner for approval to direct the Contractor to proceed with Work prior to Owner's final acceptance of Contractor's proposed changes in the Contract Sum and / or changes in the Contract Time.
   01 CCD's are primarily issued to eliminate impact to the Contractor's schedule for the directed Work for the following reasons:
      a. Final agreement on cost has not been achieved.
      b. Final agreement on time extensions has not been achieved.
      c. Final Owner approval of the change document has not been achieved (i.e. school board action required at a regular board meeting).
   02 CCD's shall be signed by all parties – Owner, Architect and Contractor – upon issuance.
   03 CCD's shall be initiated and processed using the Architect's electronic project document management software.

B. Contractor's Action:
   01 Upon receipt of a CCD, the Contractor shall expeditiously distribute the CCD to all affected parties / subcontractors as required for implementation of the directed Work.
   02 Failure by the Contractor to expeditiously distribute the CCD directive which subsequently results is a claim for additional cost shall preclude any consideration of the claim.

C. Contractor's Final Pricing for CCDs:
   01 The CCD shall include information of how final costs shall be determined.
   02 The CCD shall include information regarding consideration for any allowance of extensions of Contract Time.
   03 If final cost is to be determined on a time and material basis, Contractor shall maintain and furnish detailed records of all time, employee activities and material expenses associated with the CCD.
      a. Upon agreement by the Owner and Contractor, the CCD may include a "Not to Exceed" amount relative to a time and material cost basis.
   04 If a CCD is issued due to disagreement on the Contractor's proposed pricing of a CPR or PCR, the disputed pricing of the CPR or PCR response shall represent the Contractor's maximum cost to implement the CCD directed Work.
   05 If a CCD is issued due to disagreement on the Contractor's request for extension of time relative to a CPR or PCR, the disputed extension of time of the CPR or PCR response shall represent the Contractor's maximum extension of time to implement the CCD directed Work.

D. Upon completion of the CCD directed Work, if the final Contractor's submitted cost and / or request for extension of time is not agreed upon by the Owner, the Contractor may pursue other claim remedies in accordance with the Contract.

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION

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. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements

1. Section 01 21 00, Allowances
2. Section 01 32 16, Construction Progress Documentation
3. Section 01 77 00, Closeout Procedures

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with continuation sheets
   b. Submittal schedule
   c. Items required to be indicated as separate activities in Contractor's construction schedule
2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least two line items (one each for labor and materials) for each Specification Section.

1. Identification: Include Project name, name of Architect, Contractor's name and address, and date of submittal on the schedule of values.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of two percent of the Contract Sum.
   a. Include a separate line item under Contractor in an amount totaling $15,000 for Project closeout requirements.
   b. Include a separate line item for each subcontract in excess of $100,000 for Project closeout requirements.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Allowances: Provide a separate line item in the schedule of values for each allowance.

7. Provide separate line items in the schedule of values for bonds, insurance, permits, mobilization, supervision, temporary facilities, trench safety systems, temporary erosion- and sedimentation-control measures, fee, profit, general overhead expense, and other similar expenses.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Submit Application for Payment to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
   1. Submit draft copy of Application for Payment five (5) days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 or similar forms acceptable to the Architect and Owner. Submit alternate forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Incomplete applications will be returned without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Allowance Expenditure Authorizations, Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. 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. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   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 stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit four signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors
   2. Schedule of values
   3. Contractor's construction schedule
   4. Submittal schedule

5. Copies of building permits

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted.

2 PRODUCTS (NOT USED)

3 EXECUTION (NOT USED)

END OF SECTION 01 29 00

SECTION 01 29 73

SCHEDULE OF VALUES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the work, as specified herein and in other provisions of the Contract Documents.

C. Related Work:
   01 Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   02 Section 01 29 76 – Progress Payment Procedures
   03 Each Specification Section shall be used to determine requirements and breakdown of the schedule of values.

1.2 SUBMITTALS

A. Schedule of Values - Draft: Prior to the first application for payment, and within thirty (30) calendar days after execution of the Owner-Contractor Agreement, submit a proposed schedule of values to the Architect, as outlined below, for review.
   01 The schedule of values is represented in Column C of the AIA G702/G703 – Application for Payment.

B. Coordinate with the Architect and determine what additional breakdown, if any, is required to be submitted for final approval.

C. Secure the Architect's approval of the schedule of values prior to submitting the first Application for Payment.

D. Schedule of Values – Final: Upon approval by the Architect, the final schedule of values shall be submitted for review and acceptance.
   01 Once established, the schedule of values shall not be altered, except for the execution of a Change Order to the Contract.
   02 Once established, provide an Excel file of the AIA G703 (or a customized spreadsheet) containing line number (column A), description (column B), and dollar value (column C), including totals (column G), to Architect for their use.

1.3 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so requested by the Architect, provide copies of the subcontracts or other data acceptable to the Architect, substantiating the line item amounts in the schedule of values.

C. At a minimum, the schedule of values shall be broken down into costs for each Specification Section as labor and materials.
   01 Where Specification Sections cover multiple Scopes of Work or products, the schedule of values shall reflect each scope / product separately.

D. The Contractor is encouraged to make the schedule of values very detailed in order to facilitate review and approval of requested percentages complete on Pay Applications.
   01 Where breakdown is vague, or includes multiple / combined assemblies, stages, tasks, etc., Architect's review shall be conservative in favor of the Owner regarding approval of Pay Applications.

PART 2 - PRODUCTS

2.1 APPLICATION FOR PAYMENT SCHEDULE OF VALUES

A. The schedule of values, once approved shall be transferred to Columns B and C of AIA G702/G703 – Application for Payment to be used for all progress payments.

B. Once AIA G702/G703 – Application for Payment has been submitted for payment, individual line item amounts in Column C must remain unchanged throughout the progress of the Work.

C. In the beginning stages of the construction, total amounts for entire Divisions may be used if complete breakdowns are not available; and shall be line item populated as soon as practical.

D. No payments will be approved in Divisions that do not have a line item breakdown.

E. Allowances shall be shown, and remain throughout construction, as a single line item on the Master Application for Payment in amount(s) as stipulated in the Contract Documents.

F. For each Allowance, expenditures and accounting shall be included on a separate, attached spread sheet of the same format as the Master Application for Payment.

G. The Master Application for Payment shall reflect only the summary of each Allowance; and shall not contain individual Allowance activity(s).

2.2 SCHEDULE OF VALUES - ALTERNATES

A. For accepted Alternates which are "stand alone" Scopes of Work, separately indicate each Alternate with its own corresponding schedule of values.

B. For accepted Alternates that are integrated into multiple trades performing the Work, adjust individual line item schedule of values to reflect the scope each trade performing work of the Alternate.

C. Coordinate with the Architect as required.

2.3 SCHEDULE OF VALUES FOR ALLOWANCE EXPENDITURES

A. Each Owner approved allowance in the Contract shall be stated as a single line item in the schedule of values.
   01 The scheduled value in Column C shall be the total of the Allowance and shall remain constant throughout the progress of the Work.

B. In addition to the Master Application for Payment, for each Allowance, the Contractor shall develop a separate, supplemental spreadsheet in the same format as AIA G703 that shall track approved expenditures of the Allowance.

C. Each approved Allowance expenditure item shall be listed separately with the authorized / scheduled value identified in Column "C" on the supplemental Allowance spreadsheet.

D. Progress on each expenditure shall be tracked on the supplemental spreadsheet (i.e. previously billed, Work this period, overall completion percentage, etc.).

E. The Master Application for Payment shall include ONLY summary totals from each Allowance supplemental spreadsheet for each Pay Application period.

2.4 SCHEDULE OF VALUES

A. Schedule of values for Specification Division 2 through 33 shall be broken down for each separate section of work and include multiple items / Scopes of Work covered where appropriate.
   01 Each item of Work shall be broken down by material and labor at a minimum.
   02 Where payment for Shop Drawings, submittals, Record Drawings and similar are expected to be billed separately, the items must be included as a standalone item on the schedule of values.

B. In order for a subcontractor / trade to invoice for the following items, each item must be listed separately under the appropriate section of their respective work:
   01 Mobilization
   02 Overhead & supervision
   03 Submittals / Shop Drawings
   04 Coordination Drawings
   05 Operations and maintenance manuals
   06 Close-out documentation

C. For projects that include work on multiple buildings, each building's Scope of Work shall be listed separately on the schedule of values.

D. For larger projects, the schedule of values shall be broken down by building areas (i.e. A, B, C, D, etc.) and floor (1st, 2nd, etc.) as identified on the Drawings for the following Scopes of Work.
   01 Division 3 – Concrete
   02 Division 5 – Structural Steel
   03 Division 7 – Roofing
   04 Division 21 – Fire Protection
   05 Division 22 – Plumbing
   06 Division 23 – Mechanical
   07 Division 26 – Electrical
   08 Division 27 – Communications / IT

2.5 SCHEDULE OF VALUES BREAKDOWN

A. Schedule of Values – The following shall represent the minimum breakdown of line items; and shall include material and labor for each item where applicable:

   DIVISION 1 – GENERAL CONDITIONS
   01 Building Permits
   02 Bonds
   03 Insurance

04 General Contractor's Fee
05 General Contractor's Overhead
06 Supervision
07 Mobilization
08 Temporary Facilities
09 Temporary Fencing
10 SWPPP
11 General Cleaning
12 Final Cleaning
13 Close-Out Documents
14 Operation and Maintenance Manuals
15 Record Drawings
16 MEP Coordination Drawings
17 Allowances (list each separately)
18 Alternates (list each separately as applicable)

DIVISION 2 – EXISTING CONDITIONS
01 Building Demolition
02 Selective Demolition

DIVISION 3 – CONCRETE
01 Below Slab Vapor Membrane
02 Drilled Piers / Spread Footings
- a. Formwork
- b. Reinforcement
- c. Concrete
- d. Placement

03 Grade Beams
- a. Formwork
- b. Reinforcement
- c. Concrete
- d. Placement

04 Slab on Grade
- a. Formwork
- b. Reinforcement
- c. Concrete
- d. Placement

05 Cementitious Wood Fiber Decks
06 Lightweight Insulating Concrete
07 Bank Vault
- a. Formwork
- b. Reinforcement
- c. Concrete
- d. Placement

DIVISION 4 – MASONRY
01 Project Coordination Drawings
02 Masonry Ties
03 Brick Veneer – Exterior
04 Brick Veneer – Interior
05 CMU
06 Masonry Cleaning
07 Water Repellant

DIVISION 5 – METALS
01 Steel Shop Drawings

02 Project Coordination Drawings
03 Structural Steel
04 Structural Steel Erection
05 Steel Joists
06 Steel Decking (each level)
07 Light Gage Steel Framing
08 Metal fabrications
09 Metal Stairs
10 Pipe and Tube Railing
11 Decorative Handrails

DIVISION 6 – WOOD AND PLASTICS
01 Rough Carpentry
02 Glue Laminated Construction
03 Finish Carpentry
04 Millwork

DIVISION 7 – THERMAL AND MOISTURE PROTECTION
01 Weather Barrier / Dampproofing
02 Elastomeric Sheet Waterproofing
03 Shower Stall Waterproofing
04 Building Insulation
05 Metal Roofing
06 Metal Wall Panels
07 Roofing (list each type separately)
08 Sheetmetal Flashing
09 Roof Accessories
10 Roof Hatches and Vents
11 Penetration Fire-stopping
12 Fireproofing
13 Joint Sealants

DIVISION 8 – DOORS AND WINDOWS
01 Hollow Metal Frames
02 Hollow Metal Doors
03 Aluminum Doors and Frames
04 Plastic Laminate-Faced Wood Doors
05 Automatic Fire Doors and Frames
06 Access Doors and Frames
07 Coiling Counter Doors
08 Sound Control Doors
09 Finish Hardware
10 Glazed Systems – Framing
11 Glazed Systems – Glazing
12 Louvers and Vents

DIVISION 9 – FINISHES
01 Project Coordination Drawings
02 Plaster Assemblies
03 Gypsum Board Assemblies – Walls
   a. Metal Framing
   b. Gypsum Board
   c. Taping and Floating
04 Metal Framing – Ceilings
   a. Metal Framing
   b. Gypsum Board

c. Taping and Floating
05 Ceramic Tile Floors
06 Ceramic Tile - walls
07 Quarry Tile
08 Porcelain Tile Floors
09 Acoustical Ceilings
10 Concrete Floor Sealer
11 Sport Flooring
12 Wood Stage Flooring and Stairs
13 Non-Wood Stage Flooring
14 Resilient Tile Flooring
15 Seamless Epoxy Flooring
16 Carpet
17 Synthetic Wall Coverings – Each Type
18 Acoustical Panels
19 Sound Absorbing Wall Units
20 Painting
21 Elastomeric Coatings

DIVISION 10 – SPECIALTIES
01 Miscellaneous Specialties
02 Marker Boards
03 Tack Boards
04 Visual Display Conference Unit
05 Multi-Media Board and Tack Board
06 Display Cases
07 Exterior Signage
08 Interior Signage
09 Toilet Partitions
10 Shower and Dressing Compartments
11 Cubicle Curtain and Track
12 Operable Partitions
13 Corner Guards
14 Toilet and Bath Accessories
15 Fire Extinguishers and Cabinets
16 Metal Lockers
17 Wood Benches
18 Mobile Storage Shelving
19 Aluminum Walkway Covering
20 Flag Poles

DIVISION 11 – EQUIPMENT
01 Safes
02 Residential Appliances
03 Food Service Equipment
04 Library Stack Systems
05 Projection Screens
06 Stage Curtains
07 Theater Sound Systems and Equipment
08 Gymnasium Equipment
09 Interior Scoreboards
10 Playground Equipment

DIVISION 12 – FURNISHINGS
01 Horizontal Blinds
02 Manufactured Plastic-Laminate-Clad Casework

03 Entrance Floor Mats and Frames
04 Site Seating and Tables
05 Bicycle Racks

DIVISION 13 – SPECIAL CONSTRUCTION

DIVISION 14 – CONVEYING SYSTEMS
01 Hydraulic Elevators
02
DIVISION 21 – FIRE PROTECTION
01 Project Coordination Drawings
02 Fire Alarm Devices
03 Fire Alarm Wiring
04 Fire Sprinkler Equipment
05 Fire Sprinkler Piping
06 Fire Sprinkler Fixtures
07 Fire Sprinkler Trim-Out

DIVISION 22 - PLUMBING
01 Project Coordination Drawings
02 Under Slab Sanitary
03 Bentonite Dams At Trenches
04 Above Slab Sanitary
05 Above Slab Water
06 Plumbing Fixtures
07 Plumbing Trim-Out

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING
01 Project Coordination Drawings
02 Rigid Ductwork
03 Flexible Ductwork
04 Grilles and Diffusers
05 Mechanical Trim Out
06 Air Handlers
07 Condensing Units

DIVISION 26 –ELECTRICAL
01 Project Coordination Drawings
02 Panelboards
03 Transformers
04 Generator
05 Site Underground Electrical
06 Site Lighting
07 Under Slab Electrical
08 Bentonite Dams At Trenches
09 Electrical Rough-in – Power
10 Electrical Rough-in – Lighting
11 Power Devices
12 Light Fixtures
13 Electrical Trim Out
14 Data and Technology
15 Communication System
16 Security System – Video
17 Security System - Intrusion
18 CATV System

DIVISION 31 – EARTHWORK
01 Site Clearing
02 Excavation, Fill and Earthwork
03 Site Drainage / Erosion Control
04 Bentonite Dams At Trenches
05 Rough Grading
06 Finish Grading
07 Storm Drainage
08 Site Water Utilities
09 Site Sanitary Sewer
10 Termite Control
11 Lime Stabilization

DIVISION 32 – EXTERIOR IMPROVEMENTS
01 Concrete Paving
02 Lime Stabilization
03 Curbs
04 New Approaches at Public Streets
05 Sidewalks / Miscellaneous Concrete Flatwork
06 Screen Wall Foundation
07 Chain Link Fencing
08 Ornamental Fencing
09 Site Signage
10 Marquee Sign

B. The following work shall be listed as a separate line item if the sub-contractor anticipates invoicing separately for the work:
01 Mobilization
02 Subcontractor temporary facilities
03 Subcontractor Bonds
04 Submittals
05 Shop Drawings
06 Rough-In
07 Fixtures / Equipment
08 Trim-Out
09 Close-Out Documents / Record Drawings

2.6 SCHEDULE OF VALUES FOR ALLOWANCE EXPENDITURES

A. For Owner approved expenditures from Allowances included in the Contractor's Proposal, the Application for Payment shall include a separate, supplemental spreadsheet in the same format as AIA G703.
01 Provide a separate supplemental spreadsheet for each Allowance included in the Contract.

B. Each approved Allowance expenditure item shall be listed separately with the authorized / scheduled value identified in Column "C".

C. Progress on each expenditure shall be tracked on the supplemental spreadsheet (i.e. previously billed, work this period, overall completion percentage, etc.).

D. The Master Application for Payment shall include ONLY totals from each Allowance supplemental spreadsheet for each application period.

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT SOFTWARE

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work: This Section specifies administrative and procedural requirements necessary for project management utilizing on-line project management software.
   01 Owner designated project management software – TBD.
   02 Architect's project management software – Newforma / Info Exchange (NIX)

B. Related Work:
   01 Section 01 26 00 – Contract Administration Document Management
   02 Section 01 31 13 – Project Coordination
   03 Section 01 33 00 – Submittal Procedures
   04 Section 01 77 00 – Close-Out Procedures

1.2 QUALITY ASSURANCE

A. The Architect or Owner shall provide live training and / or tutorial training videos to key Contractor personnel, including but not limited to:
   01 Project manager and assistant project managers as applicable
   02 Project superintendent and assistant superintendents as applicable
   03 Administrative support staff
   04 Others as requested by the Contractor or Architect

B. The Contractor shall designate one member of his project team that will be responsible for assuring proper, timely and continuous usage of the project management software throughout the duration of the Project.
   01 Contractor's personnel shall become proficient in the use of the software.

C. Contractor shall ensure usage of the project management software throughout the project.
   01 In the event any Contractor key personnel are replaced or new key personnel are brought into the project team, the Contractor shall ensure the replacement personnel are trained and become proficient in the use of project management software.

PART 2 - PROJECT MANAGEMENT ELEMENTS

2.1 SUBMITTALS

A. Refer to Section 01 33 00 – Submittal Procedures for specific information regarding the requirements for submittals.

B. All submittals shall be submitted in electronic format except physical samples and mock-ups, unless otherwise agreed to by the Architect.

2.2 REQUEST FOR INFORMATION - RFI

A. An RFI shall be submitted by the Contractor to the Architect to obtain project information where pertinent information is not readily identifiable in the Contract Documents.

B. The Contractor is not limited on the reason for submitting and RFI; however, the Contractor shall perform a thorough review of the Contracts Documents to assure the needed information is not already included in the Contract Documents.

C. Where there are discrepancies between different parts of the Contract Documents, the Contractor is required to submit an RFI for clarification prior to proceeding.
   01 The Contractor assumes full responsibility of the work – acceptable or not acceptable – if he proceeds without submitting an RFI.
   02 Note: In cases of discrepancy the General Conditions of the Contract require the Contractor and subcontractors to base their proposal on the most quantity and / or best quality, as applicable.

D. Whenever possible, for each RFI, the Contractor shall provide a suggested / recommended answer or solution to the RFI.

PART 3 – EXECUTION

3.1 PROJECT MANAGEMENT PROCESSES

A. The following elements of the project shall be generated, communicated and managed through the Architect's and / or Owner's project management software:
   01 Submittal processing.
   02 Request for information (RFI) processing.
   03 Architect's Supplemental instructions (ASI) processing
   04 Change proposal request (CPR) processing
   05 Allowance expenditure authorization (AEA) processing
   06 Punch list coordination verification
   07 Warranty processing

B. Contractor Initiated Elements: The Contractor shall initiate processing of the following elements:
   01 Submittal processing.
   02 Request for information (RFI) processing.
   03 Punch list processing and coordination with the architect

C. Architect Initiated Elements: The Architect shall initiate processing of the following elements:
   01 Architect's Supplemental instructions (ASI) processing
   02 Change proposal request (CPR) processing
   03 Allowance expenditure authorization (AEA) processing
   04 Punch list coordination verification
   05 Warranty processing

3.2 SUBMITTAL PROCESSING

A. The Contractor shall initiate transmission of all submittals through the project management software.
   01 Refer to Section 01 33 00 – Submittal Procedures for required submittal numbering, grouping and Contractor review.

B. Distribution lists for submittals shall be as agreed upon by the Architect and Contractor, which shall vary depending on the specific submittal subject.
   01 Coordinate with Architect to develop distribution lists prior to the start of the submittal process.

C. The Architect shall be responsible for transmitting all reviewed submittals, including consultant submittals, back to the Contractor.
   01 The project management software will auto-generate an email notification to the Contractor that the submittal response / review is complete and available.
   02 The email shall include a link to the submittal response / review.

3.3 RFI PROCESSING

A. The Contractor shall initiate transmission of all RFI's through the project management software.

B. RFI numbering shall be auto-generated by the program.

C. The Contractor shall fill out the following fields:
   01 RFI subject
   02 RFI recipient, which shall be the Architect's designated recipient for RFI's
   03 Other recipients to be copied on the RFI.

D. There are two options available to convey the text of the RFI:
   01 Type the RFI and proposed solution directly into the relative fields on the project management software RFI page. Any supplementary documents may be attached / uploaded on the RFI page.
   02 Attach / upload the RFI and proposed solution using the Contractors standard RFI form directly on the project management software page.
   03 If option 2 is utilized, the RFI number on the Contractor's attached RFI form must match the RFI number auto-generated by the software.

E. RFI responses from the A/E recipient shall be returned to the Contractor through the project management software.
   01 The project management software will auto-generate an email notification to the Contractor that the RFI response is complete and available.
   02 The email shall include a link to the RFI response.

3.4 ASI PROCESSING

A. The Architect shall initiate transmission of ASI's to the Contractor through the project management software.

B. ASI numbering will be auto generated by the project management software.

C. Similar to RFI's, the ASI may be written directly on the project management software page, and / or included as an attachment.

D. The project management software will auto-generate an email notification to the Contractor that the ASI has been transmitted.

E. Once an ASI is received by the Contractor, no further administrative action is required by the Contractor, with the following exception.
   01 If the Contractor believes a directive given in an ASI should result in additional cost or Contract Time, the Contractor shall have a maximum of seven (7) calendar days to notify the Architect.

02 Failure of such notification shall represent the Contractor's agreement that the ASI directive(s) do not result in additional cost or additional time.

3.5 CPR PROCESSING

A. The Architect shall initiate transmission of CPR's to the Contractor through the project management software.

B. CPR numbering will be auto generated by the project management software.

C. The project management software will auto-generate an email notification to the Contractor that the CPR has been transmitted.

D. Contractor CPR Response: The Contractor shall provide a response to each CPR that includes, but is not limited to the following:
   01 Cover letter identifying the CPR and subject, including the net overall cost or credit of the CPR.
   02 Summary sheet of material and labor of relative work to be self-performed by the Contractor.
   03 Summary sheet for total expense / credit from each involved subcontractor to include:
      a. An itemized list of materials with itemized costs and shipping costs as applicable.
      b. Personnel, labor rates and total labor for each category
      c. Equipment costs
      d. Markup(s) as allowed by the Contract.
      e. Summary of all costs
   04 All subcontractor pricing documents substantiating their pricing.
   05 Copy of the original CPR.

E. Prior to submitting a CPR response to the Architect, the Contractor shall thoroughly review all submitted subcontractor back-up.
   01 Confirm scope of work is complete and accurate.
   02 Confirm reasonableness of all material and labor costs.
   03 Confirm markup(s) are in accordance with Contract allowances.

3.6 AEA PROCESSING

A. The Architect shall initiate transmission of AEA's to the Contractor through the project management software.

B. Upon receipt, the Contractor shall affix his signature and date and return to the Architect through the project management software.

C. The Architect shall forward to the Owner for signature and return to the Architect.

D. Once the AEA has been fully executed, the Architect shall distribute to the Contractor and Owner.
   01 The final, executed AEA shall have all relative CPR's attached for record.

3.7 PUNCH LIST PROCESSING

A. Refer to Section 01 77 00 – Close-Out Procedures for additional punch list requirements.

B. All punch lists shall be completed using a software program provided by the Contractor. The software program is required to be an application to describe punch list items with the ability to utilize floor plan and photo inserts to better delineate the punch list item.
   01 The Contractor provided punch list software program must be provided along with the equipment needed for the A/E Consultants and Owner to supplement their items to the Contractor's punch list.
   02 The Contractor shall provide training to the A/E Consultants and Owner for using Contractor's punch software and equipment.
   03 The Contractor provided punch software program must provide all items listed below in paragraph 3.7, C.

C. The information to be filled in includes the following:
   01 Item Number: auto assigned by number, if not autogenerated by the software program
   02 Contract Document Room Number
   03 Building Room Number
   04 Walk-Thru Date
   05 Author of item
   06 Item Category
   07 Item Description
   08 Comments
   09 GC Completion Sign-Off
   10 A/E Consultants Sign-Off
   11 Floor Plan Insert (Option to turn off where not necessary)
   12 Photo Insert (Option to use or not use as needed)

D. Upon receipt of the Contractor's punch list, the A/E Consultants and Owner shall provide supplementation using the Contractor provided software application.

E. Implementing Correction of Punch List Items:
   01 The Contractor shall take action to address all punch list items.
   02 Upon confirming the item has been correctly and completely addressed, the Contractor shall:
      a. Designate such by filling in GC Sign-Off field
      b. Provide photographic documentation of the correction directly into the Plans App software.

F. Upon delivery of the completed punch list, the Architect (or consultant) shall back check the punch to verify the item has been satisfactorily addressed.
   01 It shall be the Architect's sole discretion to back-check partially completed punch lists.

3.8 WARRANTY PROCESSING

A. Upon receiving warranty information from the Owner, the Architect shall vet the item to determine it is or is not a warranty item covered under the Contractor's contractual warranty.

B. If legitimate, the warranty shall be processed using the project management software.

C. The Contractor shall receive notification of the warranty item by email, at which point he shall view the warranty item on the project management software.

D. The Contractor shall address all warranty items using his own personnel or by assignment to the responsible subcontractor.

E. Wherever possible, all warranty items shall be addressed within a seven (7) day period; and where not possible, the Contractor shall advise the Architect:
   01 Of why the item shall require more time, and
   02 The anticipated correction completion date for the item.

F. Upon completion, the Contractor shall designate such through the project management software.
   01 Where appropriate, the Contractor shall upload photo documentation of the completed warranty work.

END OF SECTION

SECTION 01 31 13

PROJECT COORDINATION

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:
   01 General coordination procedures
   02 Coordination CAD Drawings
   03 Coordination Revit models

B. Related Work:
   01 Section 01 32 16 – Construction Progress Schedule
   02 Section 04 20 00 – Unit Masonry
   03 Section 05 12 00 – Structural Steel Framing
   04 Section 05 41 00 – Structural Metal Stud Framing
   05 Section 09 21 16 – Gypsum Board Assemblies
   06 Section 09 51 13 – Acoustical Tile Ceilings
   07 Division 21 – Fire Protection
   08 Division 22 – Plumbing
   09 Division 23 – HVAC
   10 Division 26 – Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Submit two (2) copies of all AutoCAD Coordination Drawings printed on 30” x 42” format sheets; and additionally, one (1) electronic copy of all Coordination Drawings.
   01 A/E team shall provide AutoCAD files to the Contractor for use in developing Coordination Drawings.

C. Submit an electronic Revit (model) file containing all proposed work requiring coordination; and additionally, 2 copies printed on 30” x 42” format sheets; and additionally, one (1) electronic copy of all Coordination Drawings.
   01 A/E team shall provide Revit files to the Contractor for use in developing coordination models.

D. Submission and resubmission of Coordination Drawings / Models shall continue until all conflicts have been fully resolved and agreed upon by Architect, Contractor and Owner.
   01 AutoCAD: Upon resolution of all conflicts, submit two (2) copies of final Coordination Drawings, and one (1) electronic copy of all Coordination Drawings in AutoCAD format for implementation of the Work.
   02 Revit: Upon resolution of all conflicts, submit one (1) electronic Revit (model) file; and two (2) copies of final Coordination Drawings in PDF format.

E. Contractor shall maintain copies of all Coordination Drawings at the project site; and distribute copies to subcontractors as required to assure adherence to the conflict-free Drawings.

F. Submittal Coordination: Contractor shall devise a process for each subcontractor to use to clearly identify his work, including the ability to isolate a particular subcontractor's work.
   01 For printing purposes, assign a color code each subcontractor.
   02 Electronically for AutoCAD or Revit, assign a separate layer for each subcontractor.

1.3 QUALITY ASSURANCE

A. Coordination Drawings shall be based on field measurements, submittals, Shop Drawings and product data proposed to be furnished.

B. Coordination Drawings shall be comprised of plans, sections and elevations as required to accurately depict proposed installation of interfacing and adjacent installations and assemblies.

C. Coordination Models shall be comprised of all components required to accurately depict proposed installation of interfacing and adjacent installations and assemblies.

D. Coordination Drawings / Models shall be prepared early enough in the construction process to allow time for review, and to identify and resolve conflicts without delaying the progress of the Work.

E. Contractor's untimely submission of Coordination Drawings which result in subsequent conflicts that could have been averted by timely submission shall result in the Contractor's responsibility to bear the cost(s) to remedy the conflict(s).

PART 2 - PRODUCTS

2.1 COORDINATION DRAWINGS

A. Plan Views: Coordination Drawings shall be submitted in plan form with sufficient detail to fully describe the Work, and shall include, but not be limited to:
   01 Structural steel framing
   02 Mechanical ductwork
   03 Fire sprinkler piping
   04 Plumbing - roof and secondary drains
   05 Partitions
   06 Ceiling fur-downs

B. Elevation / Sectional Views: Coordination Drawings for mechanical rooms and central plant shall include elevation and sections through proposed work in addition to plan views; and shall include, but not limited to:
   01 Structural elements
   02 Masonry
   03 Partition framing
   04 HVAC equipment
   05 Ductwork – supplies and returns
   06 Electrical gear (panelboards and transformers)
   07 Other major components as required to confirm coordination of assemblies.

C. Shop Drawings shall depict actual proposed project conditions related to each assembly.

D. All dimensions indicated on the Drawings are based on the specific models and manufacturers of products, equipment, fixtures and miscellaneous items specified or used as a design basis.
   01 If the Contractor uses an approved product by another listed manufacturer which is different than the specific model and manufacturer listed in these Specifications, the Contractor shall be solely responsible for the coordination of any dimensional changes required, including structural, relocation of walls, equipment, fixtures, ceilings and miscellaneous items – all subject to approval by the Architect.
   02 When dimensional changes are required in these situations, the Contractor shall submit a proposed Modification Drawing to the Architect for approval prior to proceeding with the Work. All causes and effects of the dimensional change shall be indicated on the Contractor's Drawing submittal.

2.2 COORDINATION MODEL

A. Coordination models in Revit shall be complete to the point that all elements required for coordination are accurately depicted; and shall include, but not be limited to:
   01 Structural steel framing
   02 Mechanical ductwork
   03 Fire sprinkler piping
   04 Plumbing - roof and secondary drains
   05 Partitions
   06 Ceiling fur-downs
   07 Ceiling planes

B. Prior to the coordination meeting, the Contractor shall run the model through conflict resolution software (i.e. Navis Works, or similar) to identify all conflicts in the model.
   01 Provide the conflict report generated by the conflict resolution software at the review meeting(s).

C. All dimensions indicated on the Drawings or included on A/E Revit models are based on the specific models and manufacturers of products, equipment, fixtures and miscellaneous items specified or used as a design basis.
   01 If the Contractor uses an approved product by another listed manufacturer which is different than the specific model and manufacturer listed in these Specifications, the Contractor shall be solely responsible for the coordination of any dimensional changes required, including structural, relocation of walls, equipment, fixtures, ceilings and miscellaneous items – all subject to approval by the Architect.
   02 When dimensional changes are required in these situations, the Contractor shall submit a proposed Modification Drawing to the Architect for approval prior to proceeding with the Work. All causes and effects of the dimensional change shall be indicated on the Contractor's Drawing submittal.

PART 3 – EXECUTION

3.1 COORDINATION - GENERAL

A. Contractor shall coordinate operations included in various Sections of Contract Documents to assure efficient and orderly installation of each part of Work. Coordinate Work operations included under related Sections of Contract Documents that depend on each other for proper installation, connection, and operation of Work, including but not limited to:
   01 Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.
   02 Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
   03 Provide provisions to accommodate items scheduled for later installation.
   04 Prepare and administer provisions for Coordination Drawings.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of Work. Such administrative activities include, but are not limited to, following:
   01 Preparation of schedules.
   02 Installation, relocation, and removal of temporary facilities.
   03 Delivery and processing of submittals.
   04 Progress meetings.
   05 Project closeout activities.

C. Contractor will be responsible for the overall coordination review. As each Coordination Drawing is completed, Contractor will meet with Owner to review and resolve all conflicts on Coordination Drawings.

D. Coordination meetings will be held in Project field office of Contractor. Contractor is required to distribute Shop Drawings, cut sheets and submittals to subcontractors where appropriate. Reviewed Coordination Drawings will be maintained in Project field office of Contractor. Meeting minutes shall be developed by Contractor and submitted to Owner and Architect within five (5) days.

E. The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, product data, samples or similar submittals until the respective submittal has been reviewed by the Architect / Consultant without request for re-submittal.

3.2 SCHEDULE

A. The Contractor shall schedule to complete the Coordination Drawing / model submittal process prior to completion of submittal review of any trades, components or assemblies included in the Coordination Drawings.

B. The Contractor shall formulate and provide a submittal schedule to the Architect within twenty (20) days after execution of the Owner – Contractor Agreement, to allow for proper coordination and scheduling reviews.

C. In formulating the Coordination Drawing schedule, the Contractor shall allow the following review periods for Coordination Drawings:
   01 Architect – allow fourteen (14) calendar days response time, after Architect's receipt, for all submittals made to and reviewed by the Architect.
   02 Architect's Consultant – Allow twenty (20) calendar days response time, after Consultant's receipt, for all submittals which must be reviewed by Architect's Consultants.
   03 All Consultant submittals shall be returned to the Architect for delivery to the Contractor.

D. In formulating the coordination Revit model schedule, the Contractor shall allow the following review periods for Coordination Drawings:
   01 Review shall be electronically by the Contractor, subcontractors, Architect, Consultants and Owner.
   02 Contractor shall schedule review meeting(s).
   03 Allow an appropriate time period of meetings to thoroughly review identified conflicts and get consensus of the conflict resolution by all parties.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work:
   01 Contractor participation in preconstruction conference.
   02 Contractor administration of pre-installation conferences.
   03 Contractor administration of progress meetings.

B. Related Work:
   01 Section 01 31 00 – Project Management Software
   02 Section 01 31 13 – Project Coordination
   03 Section 01 31 29 – Notification of Architect Requirements

1.2 PRECONSTRUCTION CONFERENCE

A. Architect will administer preconstruction conference prior to the Contractor's mobilization on site.

B. Agenda of the preconstruction conference shall include, but not limited to:
   01 Introduction of project teams for Contractor, Architect, Program Manager and Owner.
   02 Contractor's submission of bonds and insurance certificates, if not already submitted.
   03 Review communication protocols.
   04 Review responsibilities of Contractor, Architect, Program Manager and Owner.
   05 Establish day and time for weekly Owner site meetings.
   06 Review Contractor's proposed schedule.
   07 Review and agree upon Contractor's site mobilization and location of job-site trailer.

1.3 PRE-INSTALLATION CONFERENCES

A. Contractor shall convene pre-installation conferences with each sub-contractor prior to commencing work of the sub-contractor.
   01 Contractor shall record attendance on a sign-in sheet.
   02 Contractor shall keep minutes of the conference and distribute to all attending parties prior to the start of the Work.

B. The purpose of the meeting is to fully review subcontractor's work to assure initial installation will be in accordance with the Contract Documents.

C. The agenda shall include, but not limited to the following:
   01 Review the contract documents, including any changes thereto.
   02 Review all RFI's that may affect the Work.
   03 Review the final reviewed submittals, including AE and Contractor comments.
   04 Review conditions of installation, preparation and installation procedures.
   05 Review coordination with related / interfacing work.

06 It is the responsibility of the Contractor / sub-contractor to resolve all unknown issues, unclear issues, coordination issues, and assembly interface issues in order to comply with the requirements of the Contract Documents.

D. Require attendance includes, but is not limited to the following:
01 Contractor's superintendent
02 Architect's Field Representative
03 Relative sub-contractor
04 Other sub-contractors whose work may be affected by the relative sub-contractor.

E. Pre-installation conferences shall be scheduled a minimum of forty-eight (48) hours in advance of the start of relative work unless otherwise agreed to by all parties.

F. Pre-installation conferences may be scheduled with multiple sub-contractors at the same time to facilitate awareness of related work. Coordinate with Architect's Field Representative.

G. The Contractor shall keep meeting minutes and distribute to all attendees within three (3) days after the meeting; or sooner if required to facilitate project scheduling.

1.4 PROGRESS MEETINGS

A. Contractor shall schedule and administer all project meetings after mobilization conference throughout progress of the Work at bi-weekly intervals, plus any special called meetings, and all pre-installation conferences.

B. Contractor shall make physical arrangements for meetings, preside at meetings, record minutes, and distribute copies of minutes within two (2) days to attendees, and those affected by decisions made at meetings.

C. Required Attendance:
01 Contractor's Superintendent
02 Contractor's Project Manager
03 Architect's Project Manager
04 Architect's Field Representative
05 Architect's Consultants as appropriate to agenda topics for each meeting.
06 Owner's Representative(s).

D. The primary purpose of the weekly progress meetings is to update the Owner of the project status, progress, schedule and outstanding issues. It shall not be a venue for resolving issues that can otherwise be resolved between the Contractor and Architect / Consultants; unless direct input from the Owner is required.
01 In as much as practical, meetings shall be scheduled on the same day and time each week. Changes in the normal schedule must be agreed to by all parties.

E. Agenda: The agenda for progress meetings shall include, but not be limited to:
01 Review work completed since the previous meeting.
02 Review the Contractor's two-week look ahead schedule.
03 Review status of progress schedule and adjustments thereto, and delivery schedules.
04 Review submittal log,
05 Review RFI log.
06 Review change proposal log, minor changes and other adjustments to the Work
07 Review pending changes and substitutions.
08 Review A/E construction observation reports and resolutions to outstanding issues
09 Review as-built documents and close-out progress,

10 Discuss other items affecting progress of work.
11 New business

1.5 PROGRESS MEETING MINUTES

A. Meeting minutes shall be produced in a form acceptable to the Architect.
01 Contractor shall submit a sample meeting minutes format to the Architect for review and acceptance prior to the first meeting.

B. Progress meeting minutes shall be kept and furnished by the Contractor and shall be structured to identify all discussion topics, action items and responsible party for action items.
01 A topic discussed that requires an action shall be identified by the date of the initiating meeting, the agreed upon due date of response and the party responsible for the action.

C. Each meeting with unresolved information or pending action items shall remain on the meeting minutes through one meeting beyond resolution or completion of the pending action of the item, where the item can be reviewed one more time and all parties agree the item can be closed and removed from the meeting minutes.

D. The last meeting shown on the meeting minutes shall relate to the most recent meeting held and shall include all topics of discussion at that meeting.

E. The Contractor shall distribute meeting minutes to the Owner, Program Manager and Architect within three (3) days after the meeting and additionally, paper copies of the previous meeting minutes shall be furnished to all attendees at the beginning of each meeting.

1.1 PROGRESS MEETING MINUTES

A. Progress meeting minutes shall be furnished by the Contractor and shall be structured to identify all discussion topics and action items by the initiating meeting and the eventual outcome.

B. Meeting minutes shall be produced in a form acceptable to the Architect and shall be similar to the following:

Sample – Progress Meeting Minutes

PROGRESS MEETING MINUTES
Project Name

Arcadis Project No. XXXXXX

Meeting No.:	XXX	Generated By:	XXXXX
Date:	XX-XX-XX	Contractor's File No.:	XXXXX
Start:	XX:XX AM/PM		
Finish:	XX:XX AM/PM		

ATTENDEES:

Name	Representing	Title
_____	_____	_____
_____	_____	_____
_____	_____	_____

_____	_____	_____
_____	_____	_____
_____	_____	_____

etc.

Meeting Agenda

1. Review of construction activity for previous week / two weeks (since last meeting)
2. Status of construction schedule and adjustments thereto.
3. Status of material delivery schedules and adjustments thereto.
4. Review of upcoming work (one or two week review).
5. Submittal Log review.
6. Maintenance of quality standards.
7. Review of pending changes and / or substitutions.
8. Review other items or issues affecting the work.
9. Review unresolved issues from previous meetings.

Old Business – Meeting No. XXX – XX-XX-200X

Item No.	Description	Party	Action	Due
XXX.1	XXXXXXXXXX		XXX	XXXXXXX
XXX.2	XXXXXXXXXX		XXX	XXXXXXX
XXX.3	XXXXXXXXXX		XXX	XXXXXXX
XXX.4	XXXXXXXXXX		XXX	XXXXXXX
Etc.				

New Business – Meeting No. XXX – XX-XX-200X

Item No.	Description	Party	Action	Due
XXX.1	XXXXXXXXXX		XXX	XXXXXXX
XXX.2	XXXXXXXXXX		XXX	XXXXXXX

C. Each meeting with unresolved information or pending action items shall remain on the meeting minutes, in the above format, through one meeting beyond resolution or completion of the pending action of the item, where the item can be reviewed one more time and ALL parties agree the item can be removed from the meeting minutes.

D. The last meeting shown on the meeting minutes shall relate to the most recent meeting held and shall include ALL topics of discussion at that meeting.

E. Up-to-date meeting minutes shall be furnished to all attendees at the beginning of each meeting.

F. This sample is created in Excel and an electronic copy shall be furnished to the Contractor upon request.

END OF SECTION

SECTION 01 31 26

ELECTRONIC COMMUNICATION PROTOCOL

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work:
   01 Standard protocol for use in conducting electronic communication.
   02 Standard protocol for use in electronic transfer of information.

1.2 GENERAL

A. Contractor is required to have full internet capability for use by the Project Manager at the office, and by the project superintendent at the project site / trailer.

B. Contractor is required to have capability for receiving faxed and email communication at the project site office.

C. Cell phone only telephone communication to the project site office / superintendent is permissible.

D. Prior to start of work, Architect shall compile and distribute a contact list of all parties to include name, phone number, cell phone number if applicable, fax phone number and email address.
   01 Architect's contacts
   02 Architect Consultant contacts
   03 Owner representative contacts
   04 General Contractor project manager and superintendent contacts.

E. Each party shall designate contacts / contact groups to be used for electronic communication.

1.3 EMAIL PROTOCOL

A. All email shall include a subject in the 'subject' line.
   01 Prior to start of Work, the Architect shall establish specific protocol to be followed for filling out the subject line (i.e. PISD Williams ES – xxxxSubjectxxxx.
   02 Subject line description should be relative and concise.
   03 Once established, all email communication shall adhere to the protocol.

B. If / when an ongoing email thread changes subjects, a new thread related to the new subject shall be started by the party initiating the subject change.

END OF SECTION

SECTION 01 31 29

NOTIFICATION OF ARCHITECT REQUIREMENTS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. In general, the Contractor shall notify the Architect and / or Architect's Consultants whenever there is need for clarification or interpretation of the Contract Documents.

B. Additionally, the Contractor shall notify the Architect and / or Architect's Consultants at specific phases of the Work in order to observe work in place or in progress.

C. The Project Superintendent shall notify the Architect's and Consultant's Field Representative on a regular basis of the ongoing Work.

PART 2 - NOTIFICATIONS

2.1 ARCHITECT / CONSULTANT NOTIFICATION

A. The Contractor shall notify the Architect and / or Architect's Consultant a minimum forty-eight (48) hours in advance of certain stages of construction to observe and verify work is being installed in accordance with the Contract Documents.
   01 Notification shall be sent by email or other written means.
   02 For notices less than forty-eight (48) hours in advance, Architect / Consultant shall endeavor to accommodate the request; however, Contractor assumes all responsibility for schedule delays resulting from untimely notification.

B. Notifications to the Architect shall include, but not necessarily be limited to the following:
   01 Mobilization on site.
   02 Start of asbestos abatement
   03 Start of full or partial demolition.
   04 Clearing of site / stripping of top soil
   05 Placing of each lift of select fill material
   06 Installation and cover of underground utilities.
   07 Installation of drilled / spread footings
   08 Excavation / forming of grade beams
   09 Placing of all concrete
   10 Installation of lightweight insulating concrete
   11 Installation of concrete masonry units.
   12 Installation of masonry veneer
   13 Completion of structural steel erection.
   14 Installation of metal decking.
   15 Installation of dampproofing / weather barrier
   16 Installation and concealment of insulation
   17 Installation of roofing.
   18 Installation and concealment of sheet metal work / flashing
   19 Installation of self-adhered sheet flashing.
   20 Installation of building and glazing sealants.
   21 Installation of hollow metal frames.
   22 Installation of exterior glazing framing and glass.

23 Installation of plaster assemblies.
24 Installation of ceiling grid.
25 Installation of each type of finish flooring.
26 Installation of each type of wall finishes.
27 Installation of walkway covers.
28 Installation of Food Service Equipment; also notify Food Service Consultant.

C. In addition to notifying the Architect, the Contractor shall also notify the Civil Engineer prior to the following stages:
01 Installation and cover of underground site utilities.
02 Installation and cover of manholes and other drainage structures.
03 Installation of lift stations.
04 Installation of storm detention ponds / systems.

D. In addition to notifying the Architect, the Contractor shall also notify the Structural Engineer prior to the following stages:
01 Installation of drilled / spread footings
02 Pouring of grade beams
03 Placing of all building slab concrete
04 Start and completion of structural steel framing.

E. In addition to notifying the Architect, the Contractor shall also notify the MEP Engineer prior to the following stages:
01 Installation of underground service duct bank(s)
02 Installation and cover of underground site electrical.
03 Installation and cover of underground building electrical.
04 Installation of ceiling grid and cover-up.
05 Completion of plumbing rough-in.
06 Installation of plumbing fixtures
07 Installation of HVAC equipment
08 Completion of rigid duct installation
09 Completion of electrical rough-in
10 Installation of all electrical fixtures
11 Any and all testing specified for equipment, mechanical, electrical and plumbing systems.
12 Refer to MEP Specifications for additional information and requirements.

F. In addition to the above requirements, Architect and Consultant(s) shall be notified of all equipment testing, startup procedures, and Owner demonstrations / training sessions.

2.2 INCLEMENT WEATHER NOTIFICATION

A. Owner-Contractor Agreement – Substantial Completion based on calendar days: If the project delivery includes time extensions for interruption or delay of Work due to inclement weather, the Contractor shall adhere to the following procedures for consideration of approval of the weather delay time extension requests:
01 Provide email notification to the Architect of each regular work day delay within twenty-four (24) hours of the delay (i.e. following day – latest)
02 Provide email notification to the Architect of any delays resulting from inclement weather on non-work days or holidays not later than the end of the first subsequent work day.
03 Notifications shall include the type of weather, nominal quantity of rain / wind velocity (as applicable) and description of how the event delayed the project.
04 If a single weather event results in a multiple-day delay, provide notification for each day in accordance with the above procedures.

05 The General / Supplementary Conditions to the Owner-Contractor Agreement requires allowance for average, normal rain days per month which must be accounted for in the Contractor's baseline schedule and / or Proposal calendar days. Provide notifications for all weather event delays, regardless of required rain days included in the Contractor's schedule.

06 Provide a monthly inclement weather summary log with the Application for Payment. The log shall include actual weather delay days for the month, required anticipated weather days and the net add / gain for the month; as well as, a cumulative summary of all such reports.

07 Provide a monthly updated schedule with the Application for Payment. The schedule should reflect the weather delay impact on the critical path of the schedule.

B. Owner-Contractor Agreement – Guaranteed Substantial Completion: If the project delivery includes a guaranteed Substantial Completion Date, there is no allowance for Contract Time extension due to inclement weather; however, as a matter of record, the Contractor shall adhere to the following procedures recording the weather-related interruption or delays:

01 Provide email notification to the Architect of each regular work day delay within twenty-four (24) hours of the delay (i.e. following day – latest)

02 Provide email notification to the Architect of any delays resulting from inclement weather on non-work days or holidays not later than the end of the first subsequent work day.

03 Notifications shall include the type of weather, nominal quantity of rain / wind velocity (as applicable) and description of how the event impacted the project schedule.

04 If a single weather event results in a multiple-day delay, provide notification for each day in accordance with the above procedures.

05 Provide a monthly inclement weather summary log with the Application for Payment. The log shall include actual weather delay days.

06 Provide a monthly updated schedule with the Application for Payment. The schedule should reflect the Contractor's adjustment to the schedule to make up weather delay days which impact the critical path of the schedule.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work:
   01 Requirements of Contractor to produce and maintain a detailed Critical Path Schedule (CPM) construction schedule throughout the progress of Work.
   02 Owner imposed limitations on the construction schedule.

1.2 SUBMITTALS

A. Construction schedules shall be produced using a Critical Path Method, linking associated tasks and their impact on interfacing / subsequent work.
   01 Provide schedule in as much detail as practical to accurately monitor progress of the work and adherence to the schedule.
   02 Provide in both text and graphic formats.

B. Preliminary CPM Construction Schedule: Within two (2) weeks after receipt of Notice to Proceed, submit a preliminary CPM construction schedule for review.

C. Detailed CPM Construction Schedule: Within two (2) weeks after acceptance of the preliminary CPM construction schedule, submit a detailed CPM construction schedule for review.

D. Baseline CPM Construction Schedule: Upon acceptance of the detailed CPM construction schedule, it shall be base-lined and referred to as the Project Schedule; and shall be used for schedule evaluation throughout the progress of the Work.

E. An updated CPM schedule shall be submitted with each monthly Application for Payment.
   01 Approval and process Contractor's applications for payment shall be contingent on receipt of an accurate updated CPM schedule.

1.3 QUALITY CONTROL AND QUALITY ASSURANCE

A. The Contractor shall develop and maintain a Project Schedule in accordance with the requirements of this Section. The requirement for a Project Schedule is included to:
   01 Ensure adequate planning before and during the execution and progress of the Work in accordance with the allowable number of working days and milestones.
   02 Assure coordination and execution of the Work among various trades of the Contractor, subcontractors, suppliers, third party utility companies or other related entities that may be involved in the Project.

B. The Project Schedule shall show the sequence and interdependencies of activities required for complete performance of the Work. The Contractor shall be responsible for assuring all work sequences are logical and show a coordinated plan of the Work. The Project Schedule shall employ computerized CPM planning, scheduling and progress reporting of the Work as described in this Specification. The Contractor shall create and maintain the schedule using project scheduling software approved by the Owner and Architect that utilizes the fundamentals of CPM for scheduling.

C. The Contractor shall designate a schedule representative who shall be responsible for coordinating with the PM during development and maintenance of the Project Schedule.

01 The Contractor's representative shall have the expertise to operate the CPM software and be capable of rapidly evaluating alternate scenarios to optimize management capabilities.

02 The Contractor has the option to utilize qualified outside scheduling consultation for the assistance of developing and maintaining the Project Schedule, however, the use of an outside Consultant does not relieve the Contractor of responsibilities for compliance of this Specification.

03 The Contractor's schedule representative shall have complete authority to act for the Contractor in fulfilling the schedule requirements of the Contract, and if such authority is interrupted during the Contract, approval shall be obtained in writing by the PM.

D. All activities shall have at least one predecessor and one successor unless approved by the PM. The exceptions are no predecessor is needed for the Notice To Proceed (NTP) milestone and no successor is needed for the Project Completion milestone.

E. With the exception of the specified Contract Substantial Completion milestone, the Contractor shall not use any constraints of any type without prior approval of the Owner.

F. The Project Substantial Completion milestone shall be assigned a “Finish on or Before” constraint. The required Contract Finish Date shall be assigned to track project delivery related to Contract Requirements.

G. Each activity’s “Activity ID” and “Activity Description” or “Task Name” shall remain unchanged throughout the duration of the Project subsequent the baseline acceptance by the Owner.

H. An activity’s “Activity Description” may only be revised to clarify an activity’s original scope. If the scope of an activity increases or decreases, a replacement activity shall be created.

I. Owner acceptance shall be obtained prior to making any changes or revisions to an activity’s “Activity Description”.

1.4 RELIANCE UPON SCHEDULE

A. The construction schedule will be an integral part of the Contract, and will establish conditions for various activities and phases of construction.

B. The Owner, Architect and Architect’s Consultant shall rely on the schedule to perform related and interfacing activities.

C. Whenever the progress of the Work falls behind two (2) weeks or more, the Contractor shall adjust the schedule accordingly to demonstrate how progress shall be adjusted to get back on the original schedule.

PART 2 - PRODUCTS

2.1 PRELIMINARY CPM CONSTRUCTION SCHEDULE

A. The Preliminary CPM Schedule shall be the basis for the sequence of Work during the first ninety (90) calendar days of the Contract while the Project Schedule is being developed, submitted, reviewed and accepted. The Preliminary CPM Schedule shall be updated on a monthly basis. If the acceptance of the Project CPM Schedule extends beyond one month, the Preliminary CPM Schedule shall be updated according to the requirements stated in Paragraph 2.03.

B. The Preliminary CPM Schedule shall include:

01 The Procurement activities to be accomplished (either in whole or in part) during the first ninety (90) calendar days of the Contract. The procurement activities shall include mobilization, Shop Drawing submittal, sample submittal, Architect / Engineer review and approval period, material fabrication and delivery of key and long-lead items. If portable swing space buildings are required for a project, the preliminary CPM schedule shall include milestones for relocation and installation of such swing space buildings.

02 The construction activities to be a ccomplished (either in whole or in part) during the first ninety (90) days of the Contract. These activities shall be in units of whole working days.

03 The approach to scheduling the remaining work or phases of work beyond the first ninety (90) calendar days of the Contract. The work for each phase or milestone must be represented by at least one summary activity for each major item of work such that they cumulatively indicate the entire schedule, with critical project milestones. The approximate duration for each summary activity shall include the Contractor's best estimate for the work it represents.

04 Submit a written narrative describing the Contractor's approach to mobilization, procurement, and construction during the first ninety (90) calendar days of the Project. The narrative shall elaborate on the basis for durations, major equipment to be used, and shall identify all major assumptions used to develop and support the schedule. The narrative shall also include the Contractor's description of the critical path work activity as represented in the Preliminary CPM Schedule.

C. Diagram: Graphically show the order of all activities necessary to complete the Work and the sequence in which each activity is to be accomplished.

D. Activities shown on the diagram shall include, but not necessarily be limited to:

01 Project mobilization.
02 Submittals and approvals of Shop Drawings and samples.
03 Phasing of construction.
04 Procurement of equipment and critical materials.
05 Fabrication and installation of materials and equipment.
06 Final clean-up.
07 Final inspection and testing.

E. Accurately track and incorporate delays caused by inclement weather and factors outside the Contractor's control.

F. Provide updated schedules at each regularly scheduled site progress meeting.

2.2 PROJECT CPM SCHEDULE

A. The Project Schedule shall begin at the project NTP and incorporate the accepted Preliminary.
   01 CPM Schedule including all required revisions and applicable progress updating as warranted.
   02 The Project Schedule shall indicate a logical sequence of work for each project site (school) and major restrictions from the availability and use of manpower, material and equipment.
   03 Utilize the schedule in planning, scheduling, coordinating and performing the work under this Contract (including all activities of subcontractors, equipment vendors and suppliers).
   04 The Project Schedule shall indicate the sequence and interdependencies of activities required for complete performance of the Work.

B. Proposed durations assigned to each activity shall be the Contractor's best estimate of time required to complete the activity in work days considering the scope and resources planned for the activity.
   01 In developing the Project Schedule, the Contractor shall be responsible for ensuring that subcontractor work scope and sequencing at all tiers, as well as its own work, is included.
   02 If a contract for a subcontractor has not yet been awarded for a certain portion of the Work, the Contractor is responsible for the development of the schedule for the Work as described under this Section.
   03 After the subcontractor award of Contract, the Contractor shall modify the current accepted schedule to reflect any changes or revisions for the subcontractor sequence of Work.
   04 Under no circumstance or event, shall a schedule modification or revision under this Paragraph extend a milestone.
   05 The Project Schedule shall comply with the various limits imposed by the scope of Work and by any contractually specified intermediate milestone dates and completion dates.
   06 The degree of detail shall be to the satisfaction of the PM the A/E or the Owner.

C. Provide sufficient detail and clarity of form and technique so that all work can be properly controlled and progress monitored by the PM and A/E. The Project Schedule shall consist of, but not be limited to, the following criteria:
   01 Full detail of all major procurement activities including the activities and information contained within the Preliminary CPM Schedule. Break up all procurement activities for major components and long lead items to include submittal dates, fabrication duration, and expected delivery dates.
   02 Full detail of all major construction activities including the activities and information contained within the Preliminary CPM Schedule. Add column for responsible party (i.e. owner, subcontractor trade, 3rd party, etc.) for all construction activities.
   03 Multiple Calendars shall be used for establishing Holidays and periods of non-work based on the School Operations Parameter Statement in the Project Information Section of Division 0, concrete curing activities, other weather or ambient temperature sensitive construction activities, and or other work requiring overtime or double shift work.

04 Seasonal weather conditions shall be considered and included in the planning and scheduling of all work influenced by high or low ambient temperatures, precipitation and/or saturated soil to ensure recognition, planning and anticipation of intermittent inclement weather throughout the project duration. In addition, activities of similar nature shall be assigned to independent calendars based on this weather data. Contractor to provide a Weather Log each month as part of their Schedule Submittal.

05 Activity duration in whole working days with a maximum duration of ten (10) working days each, unless otherwise approved by the PM, except for non-construction activities including mobilization, procurement and concrete curing activities.

06 For projects where hazardous materials are present and require abatement by the Owner, such abatement activities may take place prior to the Contractor's mobilization and start of any work or they may take place concurrently with the Contractor's work. In cases where abatement activities must take place concurrently with Contractor's work, the Contractor shall allow for these activities to be incorporated into the Project CPM Schedule as separate activity line items. The Contractor shall allow time for these activities to take place at the appropriate time within the project schedule and shall coordinate their work with such abatement activities.

07 At a minimum, the following guidelines, intermediate and final milestones shall be included in the project schedules for each individual project site (school), except for activities that are specifically identified to be common for all the project sites for a multi-project bundle:

a. Notice to Proceed
b. Required Periodic Inspections (examples: rebar, utilities, electrical and mechanical rough-in, overhead and architectural
c. Time allotted for coordination with and execution of abatement activities
d. Specific Phase start and finish dates – renovations and additions
e. Preliminary CPM Schedule submission and acceptance
f. Project Schedule submission and acceptance
g. Building dry-in
h. Permanent power
i. Conditioned air available
j. Completed testing and acceptance of Life Safety Systems and other critical building components
k. Completion of ADA upgrades in restrooms
l. Commissioning, when project requires
m. Ten percent (10%) minimum float for the project
n. Substantial Completion
o. Final Completion
p. Owner Turn-Over / Start-Up / Project Closeout Activity / Warranty Period / Owner Testing/Training
q. Earliest Date that Owner can occupy the affected portion of the building (by phase, by complete project, etc.). This shall include all necessary approvals, permits (Fire Marshall Acceptance, Certificate of Occupancy, etc.).

D. Deliverable: Within thirty (30) calendar days after the Notice to Proceed, the Detailed CPM Schedule deliverable submitted by the Contractor shall include at a minimum, the following information:

01 Two (2) copies (preferably 8 ½ x 11) of the project schedule. The critical path shall be readily discernible in red ink.
02 Two (2) copies of the written narrative.
03 One (1) electronic copy (accessible format not pdf)

04 A list of all rain days occurring over the past month. Each rain day shall be identified in the Weather Log.

2.3 SCHEDULE UPDATES

A. After the Project Schedule is accepted by the PM and the Contractor, it shall be "baselined" and used as a comparison for future progress updates.
   01 The accepted Project Schedule shall be updated on a monthly basis, or as directed by the Owner, throughout the duration of the work until final completion is met.
   02 The Contractor shall meet with the PM each month at a Project Progress Meeting to review the work progress update and PM comments regarding the Project Schedule update.
   03 The Contractor shall submit a schedule update no later than three (3) working days before the Project Progress Meeting for the PM to review and comment.

B. Out-of-Sequence progress logic shall be reviewed by the Contractor's scheduler and corrected before submitting the progress update.

C. The percentage of all work shall be calculated by estimating the actual remaining duration of each progressed activity. The data date of each schedule update shall be determined by the PM each month. Contractor prepared estimates of the percent completion of each scheduled activity and the necessary supporting data shall be submitted on or before the data date referenced above and shall include the following information:
   01 One (1) original of the previous month's Schedule Update indicating actual activity start and/or finish dates to date, and revised (current) remaining durations.
   02 A narrative report shall be included that indicates in writing those activities the Contractor plans to work on during the following update month and current or anticipated conditions that have delayed or may delay the work in order to discuss remedial action.
   03 The Contractor shall also explain, for work that reflects less than satisfactory progress, whether any uncompleted and/or upcoming work will (or will not) be affected in a like manner and the Contractors method of correction.
   04 Any additional written information necessary to support the updated schedule including explanations of revisions to activities: logic, durations, resources, etc.

D. In case of disagreements at the project progress meeting concerning actual progress to date, the Owner's determination shall govern. Upon completion of the schedule update meeting, the Contractor shall revise the Schedule Update to reflect progress as of the date of the schedule update meeting and any approved revisions to the Schedule Update and carry out a computer produced calculation to determine the status of the Project Schedule.

E. Each Schedule Update shall be forwarded to the PM within seven (7) calendar days after the schedule update meeting and shall include two (2) copies of the narrative report with the following information:
   01 Activities that have been added in the month of this Project Schedule Update.
   02 Activities that have been deleted in the month of this Project Schedule Update.
   03 Activities that have "Actual Starts" prior to the month of this Project Schedule Update and remain unfinished.

04 Activities that have “Actual Starts and Actual Finishes” in the month of this Project Schedule Update.
05 A description of any approved revisions to the activity descriptions, schedule logic, or initial activity durations.
06 One (1) print of the updated CPM Schedule Update indicating the progress made up to the date of the schedule update and indication of any revisions to the CPM Schedule Update.
07 A list of all rain days occurring over the past month. Each rain day shall be incorporated into the Project Schedule Calendar.

F. If the Contractor's monthly progress schedule update reflects, or PM determines, that the Contractor is at least ten percent (10%) or at least negative seven (-7) calendar days behind the “baselined” schedule, the Contractor shall provide a revised or recovery schedule.
01 The Contractor’s revised or recovery schedule must incorporate a proposed plan for bringing the work back on schedule and completing the work by the contract completion date at no additional expense to the PM or Owner.
02 A narrative indicating the revised approach to schedule recovery is to accompany the recovery schedule submittal.

2.4 PROJECT FLOAT TIME

A. Float time is not for the exclusive use or benefit of either the Contractor or the Owner. Contractor’s work shall proceed according to early start dates, and the Owner shall have the right to reserve and apportion float time according to the needs of the Project.

B. The Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any affect upon Contract completion times, providing that the actual delay does not exceed the float time associated with those activities.

PART 3 - EXECUTION

3.1 RELIANCE ON SCHEDULE

A. The Architect and Owner shall rely on the Contractor’s CPM schedule with respect to work progress and projected schedules for critical path work.

B. An updated CPM schedule shall be submitted with each monthly Application for Payment.
01 Approval and process Contractor’s applications for payment shall be contingent on receipt of an accurate updated CPM schedule.

3.2 CONSTRUCTION SCHEDULE LIMITATIONS

A. Work performed under this Contract shall be performed in accordance with the following paragraphs so that the Owner can accept the project as substantially complete as noted below.

B. When the Owner-Contractor Agreement stipulates a guaranteed completion date, the Contractor shall use all means necessary to assure adequate progress of the Work to achieve the contracted Substantial Completion date.

01 Refer to Section 01 23 00 – Alternates for modifications and revisions to provisions of the General Conditions regarding a guaranteed Substantial Completion Date.

02 Time extensions will only be considered for Owner requested changes that directly impact the critical path of the schedule.

3.3 OWNER CHANGES IN THE WORK

A. The Contractor shall evaluate Owner requested change in the Work with respect to impact, if any, to the critical path of the schedule.

B. Responses to Owner requested changes, CPR's and similar documents shall include a full description of schedule impact, if any.

01 For changes the Contractor believes will affect the critical path of the schedule, provide a revised CPM schedule, or portion thereof that clearly delineates the impact.

02 Architect and Owner shall evaluate schedule impacts and such information may be a criterion for approval to move forward with the change, or not.

03 Owner approved changes that do not affect the critical path of the schedule shall be added scope of Work the Contractor shall incorporate into the CPM schedule without change of completion date(s).

END OF SECTION

SECTION 01 32 23
SURVEY AND LAYOUT DATA

PART 1 G E N E R A L

1.1 QUALITY CONTROL

A. Conform to State of Texas laws for surveys requiring licensed surveyors. Employ a surveyor acceptable to Owner's Representative if required by the Contract.

1.2 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit name, address, and telephone number of Surveyor to Owner's Representative before starting survey work.

C. Submit documentation verifying accuracy of survey work on request.

D. Submit certificate signed by Surveyor, that elevations and locations of the Work are in conformance with the Contract.

1.3 PROJECT RECORD DOCUMENTS

A. Maintain a complete and accurate log of control and survey work as it progresses.

B. Prepare a certified survey setting forth dimensions, locations, angles, and elevations of construction and site work upon completion of foundation walls and major site improvements.

C. Submit record documents under provisions of Division 1.

1.4 EXAMINATION

A. Verify locations of survey control points prior to starting the Work.

B. Notify Owner's Representative immediately if any discrepancies are discovered.

1.5 SURVEY REFERENCE POINTS

A. The Owner will establish survey control datum as indicated on Drawings. Inform Owner's Representative in advance of time additional horizontal and vertical control points will be established so verification deemed necessary by Owner's Representative may be done with minimum inconvenience to the Owner or Contractor.

B. Locate and protect survey control points prior to starting site work; preserve permanent reference points during construction.

C. Notify Owner's Representative a minimum of 48 hours before relocation of reference points is needed due to changes in grades or other reasons.

D. Promptly report loss or destruction of reference points to Owner's Representative.

E. Reimburse the Owner for cost of reestablishment of permanent reference points disturbed by construction operations.

1.6 SURVEY REQUIREMENTS

A. Utilize recognized engineering survey practices.

B. Establish a minimum of two permanent benchmarks on site, referenced to established control points. Record horizontal and vertical location data on Project record documents.

C. Establish elevations, lines and levels to provide quantities required for measurement and payment and for appropriate controls for the Work. Locate and lay out the following with appropriate instruments:
   1. Site improvements including grading, fill and topsoil placement, utilities, and footings and slabs.
   2. Grid or axis for structures.
   3. Building foundation, column locations, and ground floor elevations.

D. Periodically verify layouts.

1.7 AS-BUILT SURVEY REQUIREMENTS

A. Detention Ponds:
   1. If a detention pond is included in scope of work, Contractor shall provide Owner and Engineer an As-Built survey of said detention pond for volume verification prior to seeding/sodding or covering pond. Contractor shall provide two hard copies and one AutoCAD file with points.
   2. For open ponds, survey shall include enough information for Engineer to perform volume verification calculations. Items shall include but not be limited to: top of bank delineation and elevations, toe of slope delineation and elevations, pilot channels (or center swale) and elevations, and inflow/outflow structures. Survey grid shall be 50' maximum. Survey shall extend a minimum of 20' outside top of bank of pond.
   3. For below grade (underground) ponds, survey shall include but not be limited to: layout of below grade structure including pipe sizes, box culvert sizes, etc. and flowlines of structure.
   4. As-Built survey shall be signed and sealed by a registered Land Surveyor.

B. Outfalls to Harris County Flood Control (HCFC) Channels:
   1. HCFC requires an As-Built Certificate for all newly constructed outfalls to their facilities. The Contractor shall provide Owner and Engineer an As-Built Certificate of any newly constructed outfalls to HCFC facilities. The As-Built survey shall include but is not limited to: detailed sketch of outfall, flowline of outfall, size and pipe type of outfall and flowline of existing channel. Survey shall include area of at least 20' around outfall.
   2. As-Built survey shall be signed and sealed by a registered Land Surveyor.

C. Sites located in the 100-year Floodplain:
   1. Sites located in the 100-year Floodplain will require an As-Built Certificate. Contractor shall provide Owner and Engineer an As-Built Survey (2 hard copies) of completed site for use in filling out said As-Built Certificate. Survey shall include but is not limited to: finished floor elevation(s) of all slabs (including recessed interior slabs, raised interior slabs and bottom of elevator pits), paving elevations, outside mechanical equipment elevations (A/C units, chillers, compressors, etc.) and all fill placed within 100-year floodplain. Survey shall include entire site.
   2. Contractor shall coordinate with Engineer for exact Governmental requirements prior to survey.
   3. As-Built survey shall be signed and sealed by a registered Land Surveyor.

PART 2 P R O D U C T S – Not Used

PART 3 E X E C U T I O N – Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all submittals required in specific Specifications Sections in strict accordance with the procedures described below.
   02 All submittals shall be processed using the Architect's project management software – Newforma via Info Exchange.

C. Related Work:
   01 Section 01 31 00 – Project Management Software
   02 All Division 2 through Division 32 Specification Sections.

1.2 PROJECT MANAGEMENT SOFTWARE

A. All submittals shall be submitted and processed using the Architect's project management software – Newforma via Info Exchange.

B. The Architect shall provide live training and / or training materials to the Contractor as needed for Contractor's understanding and use of the project management software.

1.3 QUALITY ASSURANCE

A. It is the sole responsibility of the Contractor / sub-contractor / material supplier to provide materials and Work that conforms to the requirements of the Contract Documents.

B. The function of the submittal process is to provide the Contractor / sub-contractor / material supplier additional review / quality control of the materials / work proposed to be furnished for the Work.

C. Prior to delivery to the Architect or Consultant, each submittal shall be thoroughly reviewed by the party / sub-contractor generating the submittal, as well as the General Contractor.
   01 Each reviewer shall document their review by affixing a stamp and signature, or a signed review cover sheet to each submittal. General Contractor sign-off for the submittal originator is not acceptable.
   02 All corrections shall be clearly noted.
   03 The Contractor shall determine whether the submittals are suitable to forward to the Architect / Consultant or return to the originator for revisions and re-submittal.
   04 Submittals which do not display (at least) two prior, separate reviews (submitter and General Contractor) shall be rejected and returned to the General Contractor.

D. The Architect's / Consultant's review of submittals is only for review of the general conformance with the design concept of the project and general compliance with the information given in the Contract Documents.
   01 The Architect's / Consultant's review of submittals shall NOT be construed as approval of the products, assemblies or Work being submitted, unless specifically stated as such.
   02 The Architect / Consultant shall not field verify any information requested on the submittal. That is the responsibility of the Contractor.

E. Submit only what is proposed to be furnished. Where cut-sheets, etc. also contain information on items not to be furnished, clearly indicate / identify / separate the specific items proposed to be furnished from those which are not proposed to be furnished.
   01 Where no such indication is made, it shall be understood the submittal is presenting options to be selected by the Architect / Consultant at no additional cost to the Owner.

F. Submittals shall be rejected by the Architect / Consultant for any of the following:
   01 Lack of required review stamps / cover sheets.
   02 Apparent / obvious lack of review by the General Contractor or original provider / subcontractor.
   03 An inordinate amount of revisions already noted by the General Contractor / sub-contractor.
   04 Incomplete or missing information.
   05 Inclusion of other items not proposed to be furnished.

G. The Contract Documents in electronic format may be made available to the Contractor / sub-contractor for their use, provided the users execute a release form to the Architect / Consultant. Refer to **Section AI** for applicable forms to be executed and returned the relative party (Architect / Consultant) prior to release of Contract Documents in electronic format.

H. All submittals shall be submitted with a cover sheet containing the following information:
   01 Contractor's submittals number
   02 Date of submission and dates of any previous submissions
   03 Project title and Architect's project number
   04 Relative Specification Section number
   05 Names of Contractor, subcontractor, supplier, and / or manufacturer.
   06 Signed and dated review stamp or comment sheet from the party / sub-contractor generating the submittal
   07 Signed and dated review stamp or comment sheet from the General Contractor

I. For any particular submittal, submit all written, standard format information as a single submittal; including the following as applicable to the submittal:
   01 Product Data
   02 Installation Instructions
   03 Maintenance Instructions
   04 Certificates
   05 Sample Warranties

J. For any particular submittal, submit all required Shop Drawings as a single submittal.

K. For any particular submittal, submit all required product samples as a single submittal.

1.4 ELECTRONIC DELIVERY

A. Electronic delivery of paper submittals in PDF format is required.
   01 Coordinate with the Architect for electronic of hard-copy delivery of full-size Shop Drawings submittals prior to submission.
   02 Provide a single, electronic copy of submittals with all previous review comments / mark-ups the Architect's project management software – Newforma via Info Exchange.
   03 Submittals shall be returned electronically to the General Contractor along with review comment sheets and / or mark-ups.
   04 The Contractor shall be required to print and distribute completed submittals to sub-contractors.

B. Electronic submittals in PDF format shall be made in the same format (size) of the actual submittal (i.e. 8-1/2x11, 11x17, 24x36, and / or 30x42).

C. The following are exceptions to the above and shall be submitted in electronic and hard copy:
   01 Steel Shop Drawings: to be submitted on full size, scalable sheets. Submit the number to be returned plus three (3) copies to be retained by the Architect and consultant.
   02 Bound MEP manuals / submittals in excess of twenty-five (25) pages. Submit the number to be returned plus three (3) copies to be retained by the Architect and Consultant.

D. Owner's Record Set of Submittals:
   01 The Contractor shall maintain a separate set of all final submittals to be delivered to the Owner at project close-out.
   02 Submittals shall be organized, in order, by Specification Section.

1.5 SAMPLE DELIVERY

A. Samples:
   01 Prior to submitting actual samples, deliver all electronic document submittals to the Architect.
   02 Submitted samples shall be the actual material(s) proposed to be furnished.
   03 Colors samples on paper or electronic format shall not be acceptable.

B. Unless otherwise agreed to by the Architect, all sample submittals shall be delivered directly to the Architect's office.

1.6 SUBMITTAL NUMBERING AND NAMING

A. Each submittal shall contain an identification number and specific written title. The identification number shall be auto-generated by the Architect's project management software – Newforma.
   01 Submittals numbers are auto-generated with a two (2) digit suffix based on Specification Section. (i.e. 04 20 00-01)
   02 Re-submittal numbers are auto-generated with an additional two (2) digit suffix based on Specification Section. (i.e. 04 20 00-01**-01** or 04 20 00**-01r01** per individual project settings.)
   03 Any additional GC submittal ID could be entered when sending the submittal to the Architect in the Sender ID field.
   04 Indicate the correct submittal number and description on the cover sheet.

B. Each submittal shall contain a specific written title identifying the content of the submittal.
   01 Documentation Submittal Package:
      a. Product Data
      b. Installation Instructions
      c. Maintenance Instructions
      d. Certificates
      e. Sample Warranties
   02 Shop Drawings Submittal Package:
      a. Shop Drawings
      b. Engineering Calculations
   03 Samples Submittal Package:
      a. Physical Samples
   04 O&M Manual Submittal Package (Prior to Substantial Completion:
      a. Review Copy: Hard-copy in 3-ring binder.
      b. Final Copy: Hard-copy in 3-ring binder and electronic copy on flash drive. Verify quantity with Architect.

C. Failure to comply with all quality assurance requirements may result in immediate rejection of the submittal without review. In such circumstances, no additional time shall be granted to the Contractor for resultant delays.

PART 2 - PRODUCTS

2.1 DOCUMENTATION SUBMITTAL

A. Manufacturer’s Product Data: Submit manufacturer’s complete printed data on each product; including, but not necessarily limited to product cut-sheets, specifications, quality references, MSDS sheets, and general information, as necessary to demonstrate compliance with all specified requirements.

B. Manufacturer's Installation Instructions:
   01 Submit manufacturer’s installation instructions, including all requirements as they specifically relate to the Work required in this Contract.
   02 Submission of generic details that do not depict actual conditions of the project shall be rejected.

C. Manufacturer's Maintenance Instructions: Manufacturer's printed maintenance detailing information for proper care and maintenance of the product or assembly.

D. Manufacturer’s Test Reports and Certifications: Where applicable, submit test reports and certifications demonstrating compliance with the referenced standards and requirements.

E. Warranties in Excess of one (1) Year: Submit sample copy of proposed warranties to be issued and executed for contract close-out.

2.2 SHOP DRAWING SUBMITTAL

A. Shop Drawings shall be submitted with sufficient detail to fully describe the Work included. Partial sets, if submitted without prior approval from the Architect, shall be subject to rejection and / or holding until subsequent shop drawings are submitted.

B. Details included in Shop Drawings shall depict actual project conditions related to the assembly. Details depicting generic substrates or interfacing work shall be subject to rejection.

C. All dimensions indicated on the Drawings are based on the specific models and manufacturers of products, equipment, fixtures and miscellaneous items specified or used as a design basis.
   01 If the Contractor uses an approved product by another listed manufacturer which is different than the specific model and manufacturer listed in these Specifications, the Contractor shall be solely responsible for the coordination of any dimensional changes required, including structural, relocation of walls, equipment, fixtures, ceilings and miscellaneous items – all subject to approval by the Architect.
   02 When dimensional changes are required in these situations, the Contractor shall submit a proposed Modification Drawing to the Architect for approval prior to proceeding with the Work. All causes and effects of the dimensional change shall be indicated on the Contractor's Drawing submittal.

D. Where required in individual Specification Sections, provide engineering calculations clearly demonstrating the proposed materials, products and / or assemblies meet or exceed the stated design criteria.
   01 Where required by individual Specification Sections, calculations shall be sealed and signed by a Texas Registered Engineer of appropriate discipline (structural, MEP, etc.) pertinent to the required calculations.

2.3 SAMPLE SUBMITTAL

A. Finish Samples: Submit full range of manufacturer's standard colors, textures, and patterns for Architect's selection.
   01 Prior to submission of samples, provide all relative documentation submittals to the Architect.
   02 At Architect's option sample submittals may be waived if Architect already has samples of proposed materials in the Interiors Library. Coordinate with Architect as required.

B. Selection of finishes from paper or digital representations shall not be accepted. Samples requiring selection of a color, pattern or similar finish shall be submitted in one of the following methods:
   01 Whenever possible, submit actual material product samples (i.e. carpet, aluminum, glass, plastic laminate, sealants, etc.)
   02 Paint colors for pre-finished materials shall be submitted on actual samples of substrate materials (i.e. paint on sheet metal).
   03 Manufacturer's standard color wheels or similar shall be acceptable for paint selections for field painted items; however, the Architect may require to see / approve an actual application of paint on the intended material in the field.

C. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

D. Submittals shall contain:
   01 Date of submission and dates of any previous submissions
   02 Project title and number
   03 Contract identification
   04 Names of Contractor, Supplier, Manufacturer
   05 Identification of sample, with specification section number

2.4 MOCK-UPS

A. Provide mock-ups of actual products or assemblies where required in individual Specifications.
   01 Coordinate with other trades as required for mock-ups incorporating work from multiple trades.

B. Mock-ups shall specifically represent what is proposed to be furnished in the actual, installed work.

C. Once approved, all mock-ups shall be retained by the Architect and / or be left assembled at the job site until all such Work is completed at the project; and shall become the basis for comparing / accepting actual installed work.

PART 3 – EXECUTION

3.1 PREPARATION

A. The Contractor shall formulate and provide a Preliminary Submittal Log to the Architect within twenty (20) days after execution of the Owner – Contractor Agreement, to allow for proper coordination and scheduling reviews.

B. Preliminary Submittal Log: Prior to submission of any submittals, the Contractor shall furnish a in Excel format a complete spreadsheet of all submittals proposed to be furnished.
   01 The list should be comprehensive and aligned with the CSI specification number identified in the Project Manual.
   02 Additionally, include the anticipated schedule for the submission of each submittal.
   03 The submitted spreadsheet shall include the following Columns:
      a. CSI Specification Number
      b. (Optional) Contractor's Submittal Number (Sender ID)
      c. Submittal Title/Subject
      d. Submittal Description (Shop Dwgs, Product Data, Sample)
      e. Date Submittal is expected to be received
      f. Contact's name sending the submittal

C. Upon receipt, the Architect shall review the preliminary submittal log and coordinate with the Contractor on any revisions.

3.2 SUBMITTAL COORDINATION

A. Where ever possible, individual submittals should consolidate all required submittal information (i.e. product data, installation instructions, maintenance instructions, etc.)
   01 Shop drawings, samples and similar items may be submitted separately; however, they should be submitted at the same time, unless otherwise agreed upon by the Architect.
   02 The submittals for a particular specification or assembly shall not be considered complete and reviewable until all items / information required to be submitted have been received by the Architect.
      a. Exceptions: O&M manuals, final warranties and similar end of construction items.
   03 Review of piecemealed submittals shall be at the Architect's sole discretion; and will only be considered for extraordinary conditions.

B. Group or package submittals relative to the assembly which are dependent upon each other for a thorough review (i.e. doors, frames and hardware).
   01 Time periods for proper and complete submittal reviews which are contingent on or must be coordinated with separate but related submittals shall begin at the time of the Architect's / Consultant's receipt of the last required submittal. Contractors are urged to group submittals appropriately in this regard.

C. Selection of finish samples will begin only after receipt of all finish selection samples, including exterior and interior finishes. Finishes and samples shall NOT be selected piecemeal.

D. No extensions of Contractor Time or Cost shall be allowed due to lack of submittal coordination by the Contractor.

3.3 SCHEDULE

A. The Contractor shall schedule to complete the submittal process within a maximum of one hundred twenty (120) days after execution of the Owner – Contractor Agreement.

B. In formulating the submittal schedule, the Contractor shall allow the following review periods:
   01 Architect – allow fourteen (14) calendar days response time, after Architect's receipt, for all submittals made to and reviewed by the Architect.
   02 Architect's Consultant – Allow twenty (20) calendar days response time, after Consultant's receipt, for all submittals which must be reviewed by Architect's Consultants.
   03 All Consultant submittals shall be returned to the Architect for delivery to the Contractor.

3.4 PROCEDURES

A. All submittal packages shall be transmitted / uploaded to the project management software.

B. Transmit each submittal package with coversheet containing the following information:
   01 Project name
   02 Contractor name
   03 Subcontractor and / or major supplier.
   04 Submittal number.
   05 Specification Section number and name.
   06 Type of submittal package (i.e. documentation, Shop Drawings, etc.)
   07 Subcontractor review / approval certification or stamp.
   08 Contractor review / approval certification or stamp.

C. Sub-Contractor's / Supplier's Conveyance to the General Contractor: Each sub-contractor / supplier is required to review their own submittal; and additionally, apply a signed and dated stamp certifying review, verification of products, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Contractor's Conveyance to the Architect / Consultant: The Contractor is required to thoroughly review and check all submittals received from subcontractors / suppliers; and additionally apply a signed and dated stamp certifying a thorough review.
   01 The submittal shall contain Contractor review comments and / or mark-ups as applicable.

E. Submittals forwarded to the Architect / Consultant without the Subcontractor's and Contractor's review stamp shall be automatically rejected without review and returned to the Contractor.

F. If, in the opinion of the Architect / Consultant, the submittal indicates a lack of review or the Contractor's / sub-contractor's review is incomplete, the submittal will be returned, unchecked, to the General Contractor for correction of any / all deficiencies for subsequent re-submittal.

G. Revise and resubmit submittal as required; clearly identify all changes made since previous submittal.

01 Submittals that are required to be resubmitted more than one (1) time shall be subject to additional service charges for the Architect's / Consultant's repeated review(s) as outlined in **Section 01 45 23.13 – Observation Procedures**.

H. After review, distribute copies to all concerned parties.

I. The Contractor shall perform no portion of the Work for which the Contract Documents require submittals until the respective submittal has been reviewed by the Architect / Consultant without request for re-submittal.

3.5 CLAIM NOTIFICATION

A. If the submitter or Contractor issues submittals for which an additional cost is anticipated, the submittal must clearly indicate such cost including all supporting information.

01 Lack of accompanying cost information known at the time of the original submittals shall be grounds for disallowance of such cost.

B. Upon return of submittal(s) to the originator of the submittal(s), the submitter shall thoroughly review all mark-ups and / or comments prior to proceeding with the Work.

C. Based on the mark-ups and / or comments returned, the submitter shall have fifteen (15) calendar days to submit a claim notification for additional costs the submitter may feel is warranted by the mark-ups / and or comments of the Architect or Consultant.

01 The fifteen (15) calendar day period shall commence upon Contractor's receipt of the submittal from the Architect.

D. In the absence of any claim notification within the specified time period, it shall be agreed the submitter shall provide the Work in accordance with the final, reviewed submittal at no additional cost.

E. In the event a claim notification is submitted to the General Contractor / Construction Manager, the submittal process shall not be complete until all such claim notifications have been fully resolved.

END OF SECTION

SECTION 01 35 23

PASADENA INDEPENDENT SCHOOL DISTRICT
OWNER SITE RULES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall adhere to all Owner Site Rules at all times during the Work.
   01 Failure to adhere to Owner Site Rules may result in expulsion of personnel violating rules and / or fines as established on a district-wide basis by the Owner.

B. Owner site rules are in addition to all other regulatory rules to be adhered to by the Contractor.

1.2 OWNER SITE RULES

A. No foul language or spitting on floor.

B. No tobacco products on school property. On new construction projects, tobacco products are prohibited after air conditioning systems are initially activated.

C. The possession or use of alcohol or illegal drugs is strictly prohibited.

D. No tank tops – workers must be fully clothed.

E. No workers with a history of felony convictions or warrants.

F. No parking on grass, under shade trees, sidewalks or non-vehicular paved areas.

G. Entry into any occupied Pasadena ISD facility must be cleared in advance with the District Facilities Department and at the campus level prior to scheduled entry. Upon arrival at the campus, all entrants must check in at the office for entry processing (i.e. Raptor system) and sign in and out at time of arrival and departure.

H. Contractor's employees, subcontractors and their agents and employees working on any District facility must wear picture identification with the company name. Any exceptions must be approved in advance with the designated District Representative.

I. Keep the premises free from accumulation of waste, materials or rubbish caused by the work under this Contract at each site. Boxes must be broken down prior to removal from the building. Upon completion of the Work, and prior to the final inspection, have the premises in a neat and clean condition.

J. Take all precautions necessary for the safety of, and provide protection to prevent damage, injury or loss to:
   01 All employees on the project and all other persons who may be affected thereby.
   02 All the work and all materials to be incorporated therein, whether in storage on or off the site.
   03 All property at the site and adjacent thereto including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and any other school property.

K. A competent supervisor who understands the full scope of the Work shall be on site at all times.

L. School administrative services shall at all times have priority over the Contractor's use / service / etc.

M. Any work that may interfere with school activities must be authorized in advance through administrative channels. A management plan will be devised to minimize the effect of the interference.

N. The Contractor shall be responsible to Pasadena ISD for acts and omissions of the Contractor's employees, subcontractors and their agents and employees, and other persons performing portions of the Work under the Contract.

O. No work within the confines of a secured building will be allowed without a least one District custodian present. The Contractor must pay the Pasadena ISD Custodial Department in advance for the cost of adding a custodian to a building for after-hours work.

P. Doors must not be propped open when working after-hours.

Q. Only the designated District representative who let the Contract for services will be authorized to sign documents that require releases or acceptance of Work by the District.

END OF SECTION

SECTION 01 36 13

CUTTING AND PATCHING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide cutting and patching of new or existing work as required for the proper installation of new work, including proper interface with existing work.
   02 Cutting and patching includes, but is not limited to:
      a. Gypsum board assemblies
      b. Finish flooring
      c. Wall finishes
      d. Doors and frames
      e. Ceiling assemblies

C. Related Work:
   01 Section 01 36 16 – Remodeling and Alteration Procedures
   02 Section 02 41 19 – Selective Demolition

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Submit written request in advance of cutting or alteration which affects:
   01 Structural integrity of any element of the Project
   02 Integrity of weather-exposed or moisture-resistant element
   03 Efficiency, maintenance, or safety of any operational element
   04 Visual qualities of sight-exposed elements
   05 Work of Owner or separate Contractor
   06 Any work in or around any known or potential area in which asbestos or lead based products exist.

C. Procedural Proposal for Cutting and Patching: Where prior consent for cutting and patching is required, submit proposed procedures for this Work well in advance of the time work will be performed, and request consent to proceed. Include the following information, as applicable, in the submittal:
   01 Describe the nature of the Work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the Work in terms of changes to and effects upon existing work, including structural, operational and visual changes, as well as other significant elements.
   02 List products to be used and firms that will perform Work.
   03 Give dates when work is expected to be performed.
   04 List utilities that will be disturbed or otherwise be affected by Work, including those that will be relocated and those that will be temporarily out of service. Indicate how long utility services will be disrupted.

05 Where cutting and patching of structural work involves the additional reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with the original structure to satisfy requirements.

06 Consent by the Architect to proceed with cutting and patching work does not waive the Architect's right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.

1.3 DESCRIPTION OF REQUIREMENTS

A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other Work and subsequent fitting, and patching required to restore surfaces to their original condition.

01 Cutting and patching is performed for coordination of the Work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed, to remove and replace work not conforming to Contract requirements, or for other similar purposes.

02 Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection of installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be cutting and patching.

B. Refer to other Sections of these Specifications for specific cutting and patching requirements, and limitations applicable to individual units or work.

01 Unless otherwise specified, requirements of this Section apply to Mechanical and Electrical Work. Refer to Divisions, 21, 22, 23, 26, 27 and 28 Sections for additional requirements and limitations on cutting and patching of Mechanical and Electrical Work.

1.4 RELATED REQUIREMENTS

A. Individual Specifications Sections:

01 Cutting and patching incidental to Work of this Section.

02 Advance notification to other trades of openings required in work of those trades.

03 Limitations on cutting structural members.

1.5 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural work in a manner that would result in a reduction of load-carrying capacity or load-deflection ratio.

B. Before cutting and patching the following categories of Work, submit a written request and obtain the Architect's consent to proceed with cutting and patching, as described in the procedural proposal for cutting and patching.

01 Structural steel

02 Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of Work

03 Structural concrete

04 Foundation construction

05 Shoring assemblies

06 Bearing and retaining walls

07 Structural decking

08 Exterior wall construction

09 Piping, ductwork, vessels and equipment

C. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity, to perform in the manner intended, including energy performances, or that would result in increased maintenance, or decreased operational life, or decreasing safety. Before cutting and patching the following elements of Work, and similar work elements where directed, obtain the Architect's consent to proceed with cutting and patching.
   01 Shoring, bracing, and sheeting
   02 Primary operational systems and equipment
   03 Water/moisture vapor/air/smoke barriers, membranes and flashings
   04 Noise and vibration control elements and systems
   05 Control, communication, conveying, and electrical wiring systems

D. Visual Requirements: Do not cut and patch work exposed on the building's exterior or in its occupied spaces, in a manner that would, in the Architect's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patch work. Remove and replace work judged by the Architect to be cut or patched in a visually unsatisfactory manner. If possible, retain the original installer or fabricator, or another recognized, experienced and specialized firm to cut and patch the following categories of exposed work:
   01 Architectural concrete finishes
   02 Brick and concrete unit masonry
   03 Ornamental metal
   04 Roofing
   05 Preformed metal panels
   06 Window system
   07 Gypsum or cement plaster
   08 Acoustical ceilings
   09 Carpeting
   10 Wall covering
   11 HVAC enclosure, cabinets or covers

1.6 PAYMENT FOR COSTS

A. Cost for work necessary to accommodate installation of new work shall be borne by the Contractor or subcontractor responsible for installing new work.

B. Costs caused by ill-timed or defective work, or work not conforming to Contract Documents, including costs for additional services of the Architect and other Design Consultants shall be borne by the party responsible in the judgment of Architect, for ill-timed, rejected or non-conforming work.

C. Costs for work performed on instruction of Owner, other than the correction of defective or non-conforming work shall be responsibility of the Owner, who shall issue an appropriate Change Order for the increase in costs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Except as otherwise indicated, or as directed by the Architect, use materials for cutting and patching that are identical to existing materials. If identical materials are not available or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible, with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

PART 3 - EXECUTION

3.1 GENERAL

A. Execute cutting, fitting, and patching to complete work, and to:
   01 Fit several parts together which will integrate with other work.
   02 Uncover work to install ill-timed work.
   03 Remove and replace defective and non-conforming work.
   04 Remove samples of installed work for testing.
   05 Provide openings in elements of work for penetrations of mechanical and electrical work.
   06 Fill and refinish existing holes and damaged areas.

3.2 INSPECTION

A. Before cutting, examine the surface to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.3 PREPARATION

A. To prevent failure, provide temporary support of work to be cut.

B. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

C. Take precautions not to cut existing pipe, conduit or duct serving the building, but scheduled to be relocated until provisions have been made to bypass them.

3.4 PERFORMANCE

A. Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect, proceed with cutting and patching at the earliest feasible time and complete work without delay.

B. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible, review the proposed procedures with the original installer; comply with original installer's recommendations.
   01 In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chipping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to ensure a neat hole. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover the opening when not in use.
   02 Comply with requirements of applicable Sections of Division 2 when cutting and patching, excavating and backfilling.
   03 Bypass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in walls or partitions to be removed. After bypassing and cutting, cap, valve or plug, and seal tight the remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

C. Patching: Patch with seams which are durable and as visible as possible. Comply with specified tolerances for the Work.
   01 Where feasible, inspect and test patched areas to demonstrate integrity of work.
   02 Restore exposed finishes of patched areas, and where necessary, extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
   03 Where removal of walls or partitions extend one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove the existing floor and wall coverings and replace with new materials.
   04 Where a patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch, after the patched area has received prime and base coat.
   05 Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

D. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

E. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, full thickness of the construction element.

F. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

3.5 CLEANING

A. Thoroughly clean areas and spaces where work is performed or used as access to work. Completely remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finish is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS AND ACRONYMS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 TYPICAL TRADE ORGANIZATION AND INDUSTRY ABBREVIATIONS

Acoustical Society of America	ASA
Adhesive & Sealant Council, Inc.	ASC
Air Conditioning & Refrigeration Institute	ARI
Aluminum Association	AA
American Association of State Highway Officials	AASHO
American Concrete Institute	ACI
American Council of Independent Laboratories	ACIL
American Hardboard Association	AHA
American Hot-Dip Galvanizers Association	AHGA
American Institute of Architects	AIA
American Institute of Steel Constructors	AISC
American Institute of Timber Construction	AITC
American Iron & Steel Institute	AISI
American National Standards Institute, Inc.	ANSI
American Plywood Association	PA
American Society for Testing & Material	ASTM
American Society of Civil Engineers	ASCE
American Society of Heating, Refrigeration and Air Conditioning Engineers	ASHRAE
American Society of Mechanical Engineers	ASME
American Subcontractors Association	ASA
American Woodworking Institute	AWI
American Welding Society	AWS
American Wood Preserver's Institute	ASPI
Architectural Aluminum Manufacturers Association	AAMA
Architectural Woodwork Institute	AWI
Asphalt Institute	AI
Associated General Contractors of America	AGC
Brick Institute of America	BIA
Building Research Institute	BRI
California Redwood Association	CRA
Chain Link Fence Manufacturers Institute	CLFM
Concrete Reinforcing Steel Institute	CRSI
Construction Specification Institute	CSI
Door and Hardware Institute	DHI
Facing Tile Institute	FTI
Federal Specifications	FS
Flat Glass Marketing Association	FGMA
Gypsum Association	GA
Hardwood Plywood Manufacturers Association	HPMA
International Conference of Building Officials	ICBO
Joint Sealer Manufacturers Association	JSMA
Maple Flooring Manufacturers Association	MFMA
Metal Lath Association	MLA

National Association of Architectural Metal Manufacturers	NAAMM
National Association of Mirror Manufacturers	NAMM
National Bureau of Lathing & Plastering	NBLP
National Clay Pipe Institute	NCPI
National Concrete Masonry Association	NCMA
National Electrical Manufacturers Association	NEMA
National Environmental Systems Contractors	NESC
National Fire Protection Association	NFPA
National Forest Products Association	NFPA
National Hardware Lumber Association	NHLA
National Ornamental Metal Manufacturers Association	NOMMA
National Paint, Varnish and Lacquer Association	NPVLA
National Ready Mixed Concrete Association	NRMCA
National Roofing Contractors Association	NRCA
National Society of Professional Engineers	NSPE
National Woodwork Manufacturers Association, Inc.	NWMA
Painting and Decorating Contractors of America	PDCA
Perlite Institute, Inc.	PI
Portland Cement Association	PCA
Resilient Floor Covering Institute	RFCI
Rubber and Vinyl Floor Council	RVFC
Southern Building Code Congress	SBC
Southern Forest Products Association	SFPA
Southern Hardwood Lumber Manufacturing Association	SHLMA
Steel Deck Institute	SDI
Steel Door Institute	SDI
Steel Joist Institute	SJI
Steel Structures Painting Council	SSPC
Texas Accessibility Standards	TAS
Tile Council of America, Inc.	TCA
Underwriter's Laboratories, Inc.	UL
Venetian Blind Institute	VBI
Vinyl Fabrics Institute	VFI
West Coast Lumber Inspection Bureau	WCLIB
Western Red Cedar Lumber Association	WRCLA
Western Wood Products Association	WWPA

1.2 TYPICAL CONTRACT DOCUMENT ABBREVIATIONS

Acoustical	ACOUST	Diameter	DIA
Air Handling Unit	AHU	Dimension(s)	DIM or DIMS
Alternate	ALT	Door	DR
		Each	EA
Aluminum	ALUM	Electrical	ELECT
Bottom	BOT	Elevation	ELEV
Building	BLDG	Equal	EQ
Carpet	CPT	Existing	EX or EXIST
Cast-In-Place	CIP	Expansion Joint	EJ or EXP JT
Centerline	CL	Exterior	EXT
Ceramic Tile	CT or CER TILE	Finish or Finished	FIN
Classroom	CR	Finish Floor	FF or FIN FL
Concrete	CONC	Fixture	FIXT
Concrete Masonry Unit	CMU	Floor	FL
Construction Manager	CM	Floor Drain	FL
Continuous	CONT	Flow Line	FL
Corridor	CORR	Frame	FR

Galvanized	GALV
Gauge	GA
General Contractor	GC
Grade	GR
Gypsum Board	GB or GYP BD
Handicap	HC
Hardware	HW
Height	HT
Hollow Metal	HM
Hot Dipped Galvanized	HD GALV
Inside Diameter	ID
Insulation	INSUL
Interior	INT
Lavatory	LAV
Light	LT
Manhole	MH
Manufacturer	MFGR or MFR
Marker Bboard	MB
Masonry	MAS
Material	MATL
Match Existing	ME
Maximum	MAX
Metal	MTL
Minimum	MIN
Not in Contract / Work by Others	NIC
Office	OFF
On Center	OC
Outside Diameter	OD
Overflow Drain	OD
Paint	P or PT
Plastic Laminate	PL or PLAST LAM
Radius	RAD
Reflected Ceiling Plan	RCP
Reinforcing	REINF
Reinforced Concrete Pipe	RCP
Required	REQ
Resilient Tile	RT
Restroom	RR
Roof Drain	RD
Room	RM
Rough Opening	RO
Sanitary Sewer	SAN SWR
Schedule	SCHED
Sidewalk	SW
Similar	SIM
Sink	SK
Solid Core Plastic Laminate	SCPL
Space	SP
Stainless Steel	SS
Storage	STOR
Stormsewer	STM SWR
Suspended Acoustical Ceiling	SAC
Tack Board	TB
Temporary Bench Mark	TBM
Thick	THK
Top of Curb	TC or TOC
Top of Grate	TG or TOG
Top of Steel	TS or TOS
Treated	TRTD
Typical	TYP
Urinal	URIN
Vinyl Composition Tile	VCT
Vinyl Wall Covering	VWC
Water Closet	WC
Wood	WD

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTION SERVICES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedure.

B. Scope of Work:
   01 The Contractor shall allow in his proposal the coordination and supervision of tests to be performed by an independent Material and Testing Laboratory selected by the Owner.
   02 All testing laboratory services shall be provided and paid for by the Owner outside of this Contract.
   03 A testing lab shall be selected by the Owner, and the Contractor shall be notified as soon as possible.
   04 The Contractor shall cooperate with the testing laboratory in all matters pertaining to the Work. The Owner retains the option to add to or delete any or all testing specified herein.
   05 Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals, or public authorities shall be conducted solely by the Contractor; and any required payments for such tests shall be paid by the Contractor and be included in the Base Proposal amount.

C. Related Work:
   01 Section 01 31 29 – Notification of Architect Requirements
   02 Section 01 45 23.13 – Observation Procedures
   03 Respective Sections of Specifications: Certification of products.
   04 Each Specification Section Listed: Laboratory test required and standards for testing.

D. Testing laboratory inspection, sampling and testing is required for:
   01 Division 03 – Concrete
   02 Section 03 52 16.19 – Lightweight Insulating Concrete
   03 Section 04 20 00 – Unit Masonry
   04 Section 05 12 00 – Structural Steel Framing
   05 Section 07 81 16 – Cementitious Fireproofing
   06 Section 31 20 00 – Earth Moving
   07 Section 31 23 33 – Trenching and Backfilling
   08 Section 31 32 13.19 – Lime Soil Stabilization
   09 Electrical, plumbing and mechanical tests required in relative Sections.
   10 As requested by the Owner or Architect

1.2 AUTHORITIES AND DUTIES OF THE TESTING LABORATORY

A. The testing laboratory shall provide testing services under a separate agreement with the Owner or Architect, who shall be responsible for the costs of initial testing – pass or fail.
   01 The Contractor shall be responsible for costs of all re-tests required to achieve passing results.

02 The Contractor shall be responsible for charges of the testing lab for expenses incurred for cancelled and / or mis-scheduled testing requests.
03 The testing lab shall invoice Contractor direct for all re-tests of failed initial tests; and send copies of the invoices to the Architect and Owner for record.
04 The testing lab and Contractor shall be responsible to negotiate and execute a separate agreement if required by the testing lab for charges described above.

B. The laboratory is not authorized to revoke, alter, relax, enlarge, or release any requirement of the Specifications, or to approve or accept any portion of the Work.
01 When it appears that the material furnished or work performed by the Contractor fails to fulfill Specification requirements, the testing laboratory shall promptly notify the Contractor, Architect and Owner of work being tested of such deficiencies.

C. The laboratory shall promptly distribute copies of the laboratory test and inspection reports. Standard distribution shall include copies of all reports to the Owner, Architect, and Contractor.
01 The Structural Engineer, Civil Engineer, MEP Engineer, concrete supplier, and any outside Consultants shall receive copies of the testing results regarding their particular phase of the project.
02 Electronic distribution of test reports / results is mandatory.

D. The testing lab is required to furnish a report of the status of testing performed as it relates to anticipated expenses described in the Agreement with the testing lab. Reports shall be furnished at most bi-monthly to the Owner and Architect.
01 Report information shall include verification that Owner paid testing progress corresponds with anticipated expenses.
02 The testing lab shall be required to notify the Architect and Owner immediately if / when the testing lab anticipates exceeding the lump sum fee agreed to by the Owner.
03 Such notification must occur prior to expensing 75% of the testing lab fee.

1.3 TESTING LABORATORY CONTRACTUAL RELATIONSHIPS

A. The Owner shall contract with the Testing Laboratory outside the Owner-Contractor Agreement.

B. The Owner shall pay for the initial laboratory services / tests – pass or fail.

C. In the case of a failed test that does not meet the specified requirements, the Contractor shall be responsible for payment directly to the Testing Laboratory for all services / re-testing required to achieve a passing result.
01 The Owner shall not be invoiced for services or re-testing associated with failed initial tests.

D. The Owner shall not be responsible for Contractor's mismanagement or mis-scheduling of the Testing Laboratory that results in cost to the Testing Laboratory that do not result in Testing Laboratory performing its intended function (i.e. Contractor cancellation of Testing Laboratory services previously called for).

E. The Testing Laboratory record and document all retesting of failed initial tests and charges due to the mismanagement or mis-scheduling of the Contractor.

F. The Testing Laboratory is responsible for making separate arrangements with the Contractor for invoicing reimbursement of mismanaged services and re-testing associated with failed initial tests. Such expenses shall not be invoiced to the Owner.

1.4 TESTING LABORATORY GUIDELINES AND PROCEDURES

A. Technicians scheduled to perform specific testing services must be qualified to review and perform other services that overlap (i.e., earthwork, foundation inspections, rebar inspection, and concrete), when scheduled concurrently at the project site.

B. Technician time for services performed will be reimbursed at a regular time rate. Compensation at the overtime rate will be considered for any hours over eight hours spent at the job site on a single day, field testing services performed on a Saturday or Sunday, and any field services performed on a recognized holiday.

C. Concrete design mixes will receive a cursory review with any discrepancies reported to the Architect.

D. Nuclear density testing will be based on a daily rental rate for the actual testing equipment; compensation on a per test basis will not be considered.

E. Report distribution shall include the Owner, Architect, Contractor, Civil Engineer, Structural Engineer, and others requesting or requiring review of the specific testing results.

F. Job site trips solely for cylinder pick-up shall be minimized. Whenever possible, cylinder / specimen pick-up shall be conducted when a technician is scheduled to be on-site for other testing work.

G. Structural steel inspections shall include a plant visit reviewing shop fabrication, welding and an overall review of the shop fabrication quality control standards. Structural steel field inspection shall include a 100% visual review of all field fillet welds and initial frequency of 25% ultrasonic testing of full field penetration welds. There shall be 100% visual review of all bolted connections, and a minimum of two (2) bolts tested at every bolted connection.

H. The Contractor shall bear the responsibility of scheduling all testing services. The Contractor and the testing laboratory shall assume full responsibility to coordinate the testing services. Cancellations and/or failed tests will be reimbursable to the Owner by the responsible party for the cancellation or failure of a test or service.

1.5 REFERENCES

A. Earthwork:
- 01 ASTM D4318-10 – Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- 02 ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- 03 ASTM D6938-10 – Standard Test Method for In-Place Density and Water Content of Soil-Aggregate by Nuclear Method (shallow Depth)
- 04 AASHTO T89 – Determining the Liquid Limit of Soils
- 05 AASHTO T90 – Determining the Plastic Limit and Plasticity Index of Soils
- 06 AASHTO T99 – Moisture-Density Relations of Soils

B. Concrete:
- 01 ASTM C31 / C31M – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- 02 ASTM C138 – Standard Test Method for Density (Unity Weight), Yield, and Air Content (Gravimetric) of Concrete.
- 03 ASTM C143 – Standard Test method for Slump of Hydraulic Cement Concrete.
- 04 ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

05 ASTM C231 – Standard Test method for Air Content of Freshly Mixed Concrete by the Pressure Method.
06 ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Mixed Cement Concrete.
07 ACI 301 – Specifications for Structural Concrete for Buildings.

C. Masonry:
01 ASTM C780-12 – Standard Test Method for Preconstruction and Construction Evaluation for Plain and Reinforced Unit Masonry
02 ASTM C109 / C109-11b – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2 inch cube specimens).
03 ASTM C1019 – Standard Test Method for Sampling and Testing Grout.
04 ASTM C1314 – Standard Test Method for Compressive Strength of Masonry Prisms.

D. Lightweight Insulating Concrete:
01 ASTM C495 – Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.

1.6 TESTS CONDUCTED

A. Earthwork:
01 Existing subgrade under building slabs and paving: In-place density tests for each 2,500 SF, or fraction thereof.
02 Select earth fill at building pad: In-place density tests for each 2,500 SF, or fraction thereof, of each compacted lift.
03 Proctor curve for one type of fill material. If the original choice of material does not meet the specifications, the Contractor shall pay for additional testing.
04 Liquid limit of fill material.
05 Plastic limit and plasticity index of fill material.
06 Perform moisture content tests for each 5,000 SF of building pad immediately prior to placement of under-slab vapor membrane.
07 Earth fill at new paving: In-place density tests for each 4,000 SF, or fraction thereof, of each compacted lift.
08 Proctor curve for one type of fill material. If the original choice of material does not meet the specifications, the Contractor shall pay for additional testing.
09 Liquid limit of fill material.
10 Plastic limit and plasticity index of fill material.
11 Trenching and Backfilling: In-place density tests for each 100 LF, or fraction thereof, of each compacted lift.
12 Soil Stabilization: Various tests relative to the requirements of Texas Highway Department Standard Specification for Construction of Highways, Streets and Bridges.

B. Cast-In-Place Concrete:
01 Review proposed concrete design mixes.
02 Provide full time services for the review of all drilled pier excavation and placement of concrete.
a. Include a daily report noting grid lines and locations of each pier drilled.
b. After the drilled pier shaft has been drilled, the lab shall test an undisturbed sample and verify that it meets or exceeds the design specification.
03 Provide on-site services for each concrete pour at all structural building concrete grade beams, slab on grade, columns, and other miscellaneous structural concrete.
a. Included within this scope of work is the review of all the rebar placement, size, spacing of stirrups, and miscellaneous placement requirements.

04 Cast four (4) concrete test cylinders for every 50 cubic yards or fraction thereof, placed on any day for structural concrete.

05 Cast four (4) concrete test cylinders for each 100 cubic yards, or fraction thereof, placed on any day for all other types of concrete.

06 Strength level of an individual class of concrete shall be considered satisfactory when both of the following criteria are met:

a. The arithmetic average of any three consecutive strength tests equal or exceed f'c.

b. No individual strength test (average of two cylinders) falls below f'c by more than 500 psi.

07 Conduct slump testing of concrete at intervals equal to test cylinders are made.

C. Lightweight Insulating Concrete:

01 Types of Tests:

a. Field: Wet density

b. Lab: Dry density and 28-day compressive strength

02 Number of Test Sets: Not less than one for each day's work

D. Masonry:

01 Provide pre-construction and construction evaluation of proposed mortars and grout(s).

02 Mortar Cubes: Cast four (4) mortar test specimens at random intervals during masonry work; one set specimen per 2,000 SF of surface area of masonry wall or veneer.

03 Masonry Grout: Cast four (4) grout test specimens at random intervals during masonry work; one set specimen per 2,000 SF of surface area of CMU wall, or fraction thereof.

04 Masonry Prisms: Tests shall be conducted for each 2,000 SF of surface area, or fraction thereof, on all CMU exterior (back-up) walls, and interior CMU walls 16' or taller.

E. Structural Steel:

01 Radiographic inspection shall be provided for all welds called for on the drawings as full penetration butt welds. If welds are inaccessible to radiograph, welds shall have ultrasonic inspection.

02 The testing of welded connections indicated on the drawings shall be paid for from the testing laboratory allowance; however, in the event the fabricator obtains approval from the structural engineers for additional welds not shown on the drawings, the cost of testing those additional welds shall be paid for by the Contractor.

F. Cementitious Fireproofing:

01 Verify all fireproofing has been installed to the depth(s) required to achieve the specified fire-resistance ratings.

G. Test Specimens:

01 Concrete Cylinder Specimens: Break one (1) at 7 days and two (2) at 28 days. If the 28 day break average exceeds minimum specified requirements, discard the fourth cylinder. If the 28 day break average is below specified minimum, hold and break the fourth cylinder at 56 days; or process as directed by the structural Engineer.

02 Grout Specimens: Break one (1) at 7 days and two (2) at 28 days. If the 28 day break average exceeds minimum specified requirements, discard the fourth cylinder. If the 28 day break average is below specified minimum, hold and break the fourth cylinder at 56 days; or process as directed by the structural Engineer.

03 Mortar Specimens: Break one (1) at 7 days and two (2) at 28 days. If the 28 day break average exceeds minimum specified requirements, discard the fourth cylinder. If the 28 day break average is below specified minimum, hold and break the fourth cylinder at 56 days; or process as directed by the structural Engineer.

PART 2 – GOVERNMENTAL INSPECTIONS AND CONTRACTOR TESTING

2.1 GOVERNMENTAL INSPECTIONS

A. The Contractor shall allow in his Proposal the application, coordination, scheduling and cost of all on-site inspections to be performed by governmental authorities having jurisdiction which are required for approval of the Work and occupancy of the building; including, but limited to:
   01 City departments
   02 County departments
   03 Flood Control Districts
   04 Municipal Utility Districts
   05 Health Departments
   06 Fire Marshal Offices

B. The Contractor shall also cooperate with Owner for all observations required by the Owner.

C. The Contractor shall make all corrective measures in accordance with instructions received from the governing authority inspector having jurisdiction, as required to receive 100% approval for the work being inspected.

D. The Contractor shall record and keep record of all governmental agency tests and inspections; including deficiencies noted by the agency, and corrective action(s) taken to receive final approval of the agency.

E. The Contractor shall bear all costs for initial inspections, re-inspections and any other expenses related to on-site inspections made by governing authorities.

F. No allowance shall be made for additional Contract Time, nor an increase in the Contract Sum for any unanticipated expenses or delays resulting from failed governmental inspection or resulting re-inspections required to obtain agency approval(s).

2.2 BELOW SLAB SANITARY SEWER TESTING

A. In addition to normal industry / governmental testing required for the sanitary sewer system, Contractor shall allow in his Proposal the application, coordination, scheduling and cost to provide a static water test(s) as described below.

B. The Contractor shall perform a static pressure test on all sanitary sewer piping systems below the building slab.

C. The test(s) shall be maintained continuously from the time the pipe installation is initially tested prior to final cover-up, and continue throughout all foundation preparation and placement of concrete slabs; and terminating a minimum of seven (7) days after the placement of concrete slabs.

D. Maintain sealed caps on all stub-ups to prevent dissipation of water within the piping system.

E. Any failure of the static testing indicating leakage during the above period shall be immediately reported to the Architect, MEP Engineer and Owner.

F. The Contractor shall be responsible for all corrective measures necessary to repair and / or replace defecting piping as directed by the Architect.

PART 3 – OWNER CONSULTANT OBSERVATIONS AND INSPECTIONS

3.1 GENERAL

A. Throughout the progress of the Work, the Owner's A/E consultants shall make regular site visits and prepare observation reports.

B. Refer to Specification Section 01 31 29 – Notification of Architect Requirements for specific observations required by the Architect, and the scheduling of such observations.

C. Contractor and A/E requested subcontractors shall be present for all A/E observations. Coordinate with A/E field representatives as required.

D. Contractor shall coordinate all trades as required to address issue or deficiencies identified on the observation reports.

E. Upon completion of corrective measures, Contractor shall note corrective measures, including date(s) on the observation report(s) and distribute the Architect.

3.2 TEXAS DEPARTMENT OF LICENSING AND REGULATION (TDLR)

A. The Owner /Architect shall be responsible for interfacing with Texas Department of Licensing and Registration (TDLR) regarding state approval for compliance with Texas Accessibility Standards.

B. The Owner / Architect shall make the initial submission of the Contract Documents for review.

C. TAS review comments affecting the Work shall be incorporated into the Work as directed by the Architect either by Addendum, Change Proposal Request, Minor Change or Clarification.

D. During the progress of the Work, the Contractor shall bring to the Architect's attention any portion of the Work that may be questionably compliant with TDLR / TAS.

E. The Architect shall coordinate and manage the TAS inspection of the completed project.
   01 TAS required corrective measures due to design issues shall be paid for by the Owner.
   02 TAS required corrective issues due to Contractor issues (materials, installation, etc.) shall be paid for by the Contractor.

F. All corrective work shall be completed within thirty (30) days after notification unless otherwise agreed upon by the Owner.

END OF SECTION

SECTION 01 45 23.13

OBSERVATION PROCEDURES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope of Work:
   01 The Contractor shall coordinate and cooperate with Architect and Architect's Consultants as required for on-site observations and monitoring of the Work.

B. Related Work:
   01 Section 01 31 29 – Notification of Architect Requirements
   02 Section 01 45 23 – Testing and Inspection Services

1.2 RELATED REQUIREMENTS

A. Coordination, scheduling and implementation of inspections and testing required by laws, ordinances, rules, regulations, orders or approvals, or public authorities required for interim and final approval of the Work shall be the sole responsibility of the Contractor.

B. Contractor shall maintain a log of all required governmental interim and final inspections throughout the progress of the Work.

PART 2 – PRODUCTS

2.1 GENERAL

A. Throughout the progress of the Work, the Owner's A/E consultants shall make regular site visits and prepare observation reports.

B. Contractor and requested subcontractors shall be present for all A/E observations. Coordinate with A/E field representatives as required.

C. Contractor shall coordinate all trades as required to address issue or deficiencies identified on the observation reports.

2.2 OBSERVATION REPORTS

A. Upon completion of on-site observations by the Architect and Architect's Consultants, documentation of the Observation shall be furnished to the Contractor.

B. Observation report items that reflect instructions for corrective measures shall be addressed / corrected by the Contractor in a timely manner.

C. Upon completion of corrective measures, Contractor shall detail corrective measures, including date(s) of work and date(s) of Contractor's verification of completeness on the observation report(s) and return a copy the Architect and Consultant as appropriate.

D. Wherever possible, Contractor's written documentation shall include all corrective work identified to be addressed on the observation report. Minimize piece meal responses as much as possible.

E. A complete history of Contractor's observation responses shall be required to be submitted as a condition of project close-out.

PART 3 – GENERAL – PROJECT CONSULTANT OBSERVATIONS

3.1 DESCRIPTION

A. The Contractor shall allow in his Proposal the coordination and scheduling of Observations to be performed by the Owner's project consultants; including the Architect, MEP Engineer, Structural Engineer, Food Service Consultant, Theater Consultant, and Special Systems Consultants as they may apply to this Work.

B. All project consultant observation services shall be performed by designees of the relative Consultant; upon which the Contractor may rely as to the capability and thoroughness of the observation being performed. Upon request by the Contractor, the names of A/E Field Representatives performing specific observations shall be furnished by the Architect.

C. The Owner shall pay for the observation services of the project consultants in accordance with the Owner – Architect Agreement and the requirements of the Contract Documents. Excessive observations and re-observations resulting from the Contractor's actions as described in this Section, shall be paid for by the Contractor directly to the affected Consultant.

D. The Contractor shall cooperate with the Owner's project consultants in all matters pertaining to required observations of the work as described in the Contract Documents. The Owner retains the option to add to or delete any or all observations specified herein; and thereby accept the relative work without observation.

E. Refer to Section 01 31 29 – Notification of Architect Requirements for additional information.

3.2 RELATED REQUIREMENTS

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Respective Sections of Specifications describing the required consultant observations.

3.3 AUTHORITIES AND DUTIES OF THE A/E FIELD REPRESENTATIVES

A. The project consultant representatives are not authorized to revoke, alter, relax, increase, or release the Contractor from any requirement of the Contract Documents without written notice furnished to the Contractor by the Architect.

B. When it appears that the material, assembly or work performed by the Contractor fails to fulfill Contract requirements, the project consultant representative shall promptly notify the General Contractor, Architect and Owner.

C. The project consultant representative(s) shall promptly distribute copies of the observation reports. Standard distribution shall include copies of all reports to the Owner, Architect, and General Contractor.

3.4 PROJECT CONSULTANT OBSERVATION GUIDELINES AND PROCEDURES

A. Project Consultants shall make all observations required in the Contract Documents and requested by the Contractor and Owner.

B. For each material, assembly or phase observation required in the Contract Documents, and upon request by the Contractor, the project consultant(s) shall perform the following observations as required in the Owner – Architect Agreement; and shall be at the expense of the Owner in accordance with the Owner – Architect Agreement.:
   01 Initial observation to determine compliance with the Contract Documents.
   02 Observation to determine deficiencies where the initial observation results do not show 100% compliance with the Contract Documents. At the Consultant's discretion, this observation may be performed concurrent with the initial observation.
   03 Re-observation to determine 100% compliance with the Contract Documents.

C. In the event the observation series described above does not result in 100% approval of the material, assembly or phase being inspected, all subsequent re-observations required to achieve 100% approval shall be at the sole expense of the Contractor to be paid directly to the project consultant based on the Consultant's standard hourly rates for time expended, including travel to and from the site.

D. Recognizing the size and complexity of work included in a project may be sufficiently large enough to require the project to be divided into scope areas, each such area shall be considered separate and stand-alone with respect to Paragraph 3.4-B above.
   01 Requests by the Contractor for project consultant observations of partial scope completion areas shall be considered observations of the entire scope area with respect to Paragraph 3.4-B above; and subsequent observations of the remaining portions of the same scope area shall be paid for directly to the Consultant by the Contractor.
   02 Consultants shall invoice the Contractor on a monthly basis, and payment shall be due upon the Contractor's receipt of the invoice.

E. The Contractor shall bear the responsibility of requesting and scheduling all project consultant observations required by the Contract Documents. The Contractor shall give the project consultant a minimum of forty-eight (48) hours' notice prior to the requested observation.
   01 No extension of Contract Time shall be granted for untimely observations due to the Contractor's failure of proper observation request notification.

F. Observations voluntarily made by project consultants at their discretion, not specifically requested by the Contractor, shall not count as one of the observations described in Paragraph 3.4-B above, nor shall the Contractor be liable for any related expenses.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide temporary facilities adequate to facilitate the requirements to complete the Work.
   02 Any areas disturbed by the placement of temporary facilities shall be repaired / replaced to a finished condition consistent with the surrounding finished area.

C. Related Work:
   01 Section 01 31 13 – Project Coordination
   02 Section 01 56 39 – Temporary Tree and Plant Protection

PART 2 - GENERAL

2.1 GENERAL

A. Unless otherwise agreed upon or stipulated in the Contract Documents, the Contractor shall provide all necessary temporary facilities required to effectively implement and complete the Work.

B. Temporary facilities shall be provided only for the duration of construction, unless agreed upon otherwise, and all temporary facilities shall be completely removed at the completion of the project.

C. Any areas disturbed by the placement of temporary facilities shall be repaired / replaced to a finished condition consistent with the surrounding finished area.

2.2 UTILITIES

A. The Contractor shall supply temporary job power for the Work. The Contractor shall provide all wiring, lamps, distribution of power and similar equipment as required for construction, inspection, and testing of each project.
   01 Coordinate with the local power provider as required.
   02 The Contractor is responsible for overloading or excess use, or any damage resulting from overloading or excess use, or any damage resulting from his use of utilities.
   03 For work at existing campuses / buildings, Contractor may have access to existing 110 / 120 volt receptacles. Coordinate with Owner to confirm access and usage.

B. The Contractor shall supply reliable data / internet capability at the job site trailer for use by the Contractor, Architect and Owner.
   01 Contractor shall provide hard wired data connections as required for his use.

02 The Contractor provide wireless connectivity (i.e. mobile broadband devices) for use by up to five (5) simultaneous users and a minimum speed of 50Mb per second.

C. The Contractor shall supply temporary water for the Work. The Contractor shall provide all distribution, valves, fixtures and similar equipment as required for construction, inspection, and testing of each project.
01 Coordinate with the local provider as required.
02 The Contractor is responsible for overloading or excess use, or any damage resulting from overloading or excess use, or any damage resulting from his use of utilities.
03 For work at existing campuses / buildings, Contractor may have access to existing water supply / hose bibbs. Coordinate with Owner to confirm access and usage.

D. The Contractor shall provide temporary heat to prevent freezing and maintain proper temperatures to avoid damage to materials and assemblies in the building.

E. The Contractor shall provide and maintain such dependable source of temporary utilities as may be necessary until the building is converted to permanent power and utility connection(s).

F. Where a permanent irrigation system is not in use, the Contractor shall be required to provide temporary water and electrical connections for irrigation sprinkler systems at sports fields.
01 These connections must be maintained through the duration of the Contract, or until the work is accepted, whichever is later.

2.3 FIELD OFFICE

A. The Contractor will be required to furnish a job trailer installed at a suitable location (on site), for use by the Owner, Contractor and Architect.
01 Coordinate with the Owner and Architect for acceptable location.

B. Provide and maintain a weather-tight building with operable and lockable door and windows, to serve as a job office available to the Contractor, subcontractors, and the Architect.

C. Provide lights, electricity, air conditioning and heat, as required.

D. Remove office from premises at completion of work or when a similar area / room can be set up inside the building, contingent on approval from the Owner.

E. Provide job site data / computer connection, telephone and fax, and other miscellaneous items as outlined below.
01 The job site trailer shall have a hard-wired data service for Contractor’s use.
02 Contractor’s office shall be of a size, and shall be furnished, so that it may be used for progress meetings.
03 Provide adequate artificial lighting, heating and cooling to provide comfortable conditions for occupants.

F. Furnishings Required:
01 Contractor’s Office: Racks and files for Contract Documents and for Record Documents; conference table and chairs; and desks and chairs as required by Contractor.
02 Architect’s Office: One plan table large enough to house a full size set of drawings and a chair.

2.4 SANITARY FACILITIES

A. Furnish temporary sanitary facilities and maintain in compliance with regulations of State Department of Health and other authorities having jurisdiction.

B. Maintain a regular service schedule for the facilities.

C. Use of Owner's sanitary facilities is strictly prohibited.

2.5 STORAGE FACILITIES

A. Provide and maintain adequate weather tight, lockable, enclosed storage facilities as required to securely house materials and equipment stored on the job site.
   01 Coordinate with the Owner and Architect for acceptable location(s).

B. Replace materials improperly stored and damaged by weathered conditions.

C. Allow for temporary freeze protection as required.

D. Remove storage facilities at completion of work or when materials are stored within the structure in a weather tight condition.

2.6 SIGNS

A. Within three (3) weeks after receipt of Notice to Proceed, provide one project identification sign and install at designated location at the site.

B. Fabricate the sign with sturdy wood framing and 3/4 inch thick exterior grade plywood, with medium density overlay, and a minimum area of 64 square feet (4' x 16' or 8' x 8').

C. Erect signs on 4" (102 mm) x 4" (102 mm) supports set firmly into the ground and well braced. The bottom of the sign is to be a minimum of 4' above grade, unless otherwise instructed by the Architect.

D. Prime wood surfaces and apply one coat of exterior house paint, in not more than three distinct colors.

E. Architect shall provide camera ready artwork for use in making the project sign; and shall include:
   01 The official title of the Project.
   02 The name of the Owner.
   03 3-D rendering
   04 The names and titles of School Board Members and School Administrators.
   05 The names of Architect and professional consultants.
   06 Name of the Contractor / Construction Manager.

F. Other signs permitted at the site:
   01 Warning signs.
   02 Directional signs.
   03 Identification signs at field offices.

G. Allow no other signs to be displayed at the project site, unless authorized by the Owner.

H. Secure and pay for all sign permits as required by local authorities.

2.7 BARRIERS

A. Provide temporary barricades on all portions of the site adjacent to the construction and accessible to the public.
   01 Temporary barricades shall be a minimum 72” tall chain link, self-supported fence.
   02 Provide lockable personnel and equipment gates as required for adequate access.
   03 Maintain fencing in good condition throughout the progress of the Work.

B. Where Work occurs on existing campuses or buildings, coordinate with the Owner and Architect for layout of fencing to facilitate normal Owner operations as much as possible.

C. Provide approved barriers around trees and plants designated to remain as required to protect against damage from vehicular / personnel traffic, stored materials, dumping, chemically injurious materials, and water ponding.

2.8 SECURITY

A. Determine if and when watchmen are necessary for protection to the work, and provide such services when necessary.

B. Neither the provision of watchmen nor the failure to provide watchmen shall relieve the Contractor of responsibility in event of injury to persons or damage to property.

2.9 CLEANING

A. Trash Removal:
   01 Clear the building and site of trash a minimum of once a week.
   02 When rapid accumulation occurs, make more frequent removals.
   03 Remove highly combustible trash such as paper and cardboard daily.
   04 Dumpsters will not be allowed to overflow and should be emptied on a regular basis.
   05 Use of Owner’s dumpsters and trash receptacles is strictly prohibited.

B. Disposition of Debris:
   01 Remove debris from the site and legally dispose of in strict accordance with local ordinances and regulations.
   02 Locations for disposal shall be of the Contractor's choice within the above restriction.
   03 No debris or material may be buried or burned at the site.
   04 Take necessary precautions to prevent accidental burning of materials by avoiding large accumulations of combustible materials.

C. Cleaning:
   01 Maintain installed work in a manner that will protect the work.
   02 Thoroughly clean the work, including the removal of smudges, marks, stains, fingerprints, soil, dirt, paint spots, dust, lint, discolorations, and other foreign materials.

2.10 TEMPORARY FIRST AID FACILITIES

A. Provide first aid equipment and supplies, with qualified personnel continuously available to render first aid at the site.

B. Provide a sign, posted at the telephone, listing the telephone numbers for emergency medical services: physicians, ambulance services and hospitals.

2.11 TEMPORARY FIRE PROTECTION

A. Provide a fire protection and prevention program for employees and personnel at the site.
   01 For work on existing campuses or buildings, coordinate with the Owner and Architect to develop a program that will facilitate the Owner's needs (i.e. building evacuation and similar).
   02 Where existing building users must evacuate into a work area, coordinate with the local fire marshal having jurisdiction to implement temporary measures required to maintain life safety code compliance.

B. Provide and maintain fire extinguishing equipment ready for instant use at all areas of the project, and at specific areas of critical fire hazard.

C. Equipment:
   01 Hand extinguishers of the types and sizes recommended by the National Board of Fire Underwriters to control fires from particular hazards.
   02 Barrels of water with buckets designated for fire control purposes.
   03 Water hoses connected to an adequate water pressure and supply system.
   04 Construction period use of permanent fire protection system.

D. Enforce Fire-safety Discipline:
   01 Store volatile materials in an isolated, protected location.
   02 Avoid accumulations of flammable debris and waste in or about the Project.
   03 If allowed on site at all, prohibit smoking in the vicinity of hazardous conditions.
   04 Closely supervise welding and torch-cutting operations.
   05 Supervise locations and operations of portable heating units and fuel.

E. Maintain fire extinguishing equipment in working condition, with current inspection certificate attached to each extinguisher.

2.12 CONSTRUCTION AIDS

A. Provide construction aids and equipment required to assure safety for personnel and to facilitate the execution of the work; including, but not limited to scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other equipment.

B. When permanent stair framing is in place, provide temporary treads, platforms and railings, for use by construction personnel.

C. Maintain all equipment in a first-class, safe condition.

2.13 ACCESS ROADS AND PARKING AREAS

A. Provide adequate temporary roads and walks to achieve all-weather access into the site from public thoroughfares, and within and adjacent to the site, as necessary to provide uninterrupted access to field offices, work and storage areas.

B. For work performed on existing, occupied site, coordinate with the Owner and Architects for location(s) of temporary access and construction parking.
   01 Where Contractor is allowed to use existing access roads, paving, parking, sidewalks and similar, Contractor shall thoroughly photograph or video all such areas to document existing conditions.
   02 Contractor shall repair / replace any area(s) damaged as the result of construction activities.

C. Provide adequate parking space for personnel and employees at the site, located to avoid interference with traffic, work or storage areas, or with materials-handling equipment.

D. Grade and provide drainage facilities to assure runoff of rainwater and to avoid blockage of flow from adjacent areas.

E. All temporary access roads and walks shall be removed upon completion of permanent facilities, or completion of construction.

F. All disturbed areas shall be minimally regenerated to their original condition.

END OF SECTION

SECTION 01 55 13.10
STABILIZED CONSTRUCTION ACCESS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Installation of erosion and sediment control for stabilized construction access points used during construction and until final development of the site.

1.2 SUBMITTALS

A. Manufacturer's catalog sheets and other product data on geotextile fabric.

B. Sieve analysis of aggregates conforming to requirements of this Specification.

1.3 REFERENCES

A. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

PART 2 P R O D U C T S

2.1 GEOTEXTILE FABRIC

A. Provide woven or nonwoven geotextile fabric made of either polypropylene, polyethylene, ethylene, or polyamide material.

B. Geotextile fabric shall have a minimum grab strength of 270 psi in any principal direction (ASTM D-4632), and the equivalent opening size between 50 and 140.

C. Both the geotextile and threads shall be resistant to chemical attack, mildew, and rot and shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable life at a temperature range of 0°F to 120°F.

D. Representative Manufacturers: Mirafi, Inc., or equal.

2.2 COARSE AGGREGATES

A. Coarse aggregate shall consist of crushed stone, gravel, crushed blast furnace slag, or a combination of these materials. Aggregate shall be composed of clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.

B. Coarse aggregates shall be 2" to 5" in size. No crushed concrete will be allowed.

PART 3 E X E C U T I O N

3.1 PREPARATION AND INSTALLATION

A. If necessary to keep the street clean of mud carried by construction vehicles and equipment, Contractor shall provide stabilized construction roads and exits at the construction, staging, parking, storage, and disposal areas. Such erosion and sediment controls shall be constructed in accordance with the requirements shown on the Drawings and specified in this Section.

B. No clearing and grubbing or rough cutting shall be permitted until erosion and sediment control systems are in place, other than as specifically directed by the Owner's Representative to allow soil testing and surveying.

C. Maintain existing erosion and sediment control systems located within the project site until acceptance of the project or until directed by the Owner's Representative to remove and discard the existing system.

D. Regularly inspect and repair or replace components of stabilized construction access points. Unless otherwise directed, maintain the stabilized construction roads and access points until the project is accepted by the Owner. Remove stabilized construction roads and access points promptly when directed by the Owner's Representative. Discard removed materials off site in accordance with the requirements of Division 1.

E. Remove sediment deposits and dispose of them at the designated spoil site for the project. If a project spoil site is not designated on the Drawings, dispose of sediment off site at location not in or adjacent to a stream or floodplain. Off-site disposal is the responsibility of the Contractor. Sediment to be placed at the project site should be spread evenly throughout the site, compacted and stabilized. Sediment shall not be allowed to flush into a stream or drainage way. If sediment has been contaminated, it shall be disposed of in accordance with existing federal, state, and local rules and regulations.

F. Equipment and vehicles shall be prohibited by the Contractor from maneuvering on areas outside of dedicated rights-of-way and easements for construction. Damage caused by construction traffic to erosion and sediment control systems shall be repaired immediately.

G. Conduct all construction operation under this Contract in conformance with the erosion control practices described in Division 1.

3.2 CONSTRUCTION METHODS

A. Provide stabilized access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes where shown on Drawings.

B. Provide stabilized construction exits, and truck washing areas when approved by Owner's Representative, of the sizes and locations where shown on Drawings or as specified in this Section.

C. Vehicles leaving construction areas shall have their tires cleaned to remove sediment prior to entrance onto public right-of-way. When washing is needed to remove sediment, Contractor shall construct a truck washing area. Truck washing shall be done on stabilized areas which drain into a drainage system protected by erosion and sediment control measures.

D. Details for stabilized construction access points are shown on the Drawings. Construction of all other stabilized areas shall be to the same requirements. Roadway width shall be at least 14 feet for one-way traffic and 20 feet for two-way traffic and shall be sufficient for all ingress and egress. Furnish and place geotextile fabric as a permeable separator to prevent mixing of coarse aggregate with underlaying soil. Exposure of geotextile fabric to the elements between laydown and cover shall be a maximum of 14 days to minimize damage potential.

E. Roads and parking areas shall be graded to provide sufficient drainage away from stabilized areas. Use sandbags, gravel, boards, or similar methods to prevent sediment from entering public right-of-way, receiving stream or storm water conveyance system.

F. The stabilized areas shall be inspected and maintained daily. Provide periodic top dressing with additional coarse aggregates to maintain the required depth. Repair and clean out damaged control measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto public right-of-way shall be removed immediately.

G. The length of the stabilized area shall be as shown on the Drawings, but not less than 50 feet. The thickness shall not be less than 8 inches. The width shall not be less than the full width of all points of ingress or regress.

H. Stabilization for other areas shall have the same coarse aggregate, thickness, and width requirements as the stabilized construction access points, except where shown otherwise on the Drawings.

I. Stabilized area may be widened or lengthened to accommodate truck washing area when authorized by Owner's Representative.

J. Alternative methods of construction may be utilized when shown on Drawings, or when approved by the Owner's Representative. These methods include the following:
   1. Cement-Stabilized Soil - Compacted cement-stabilized soil or other fill material in an application thickness of at least 8 inches.
   2. Wood Mats/Mud Mats - Oak or other hardwood timbers placed edge-to-edge and across support wooden beams which are placed on top of existing soil in an application thickness of at least 6 inches.
   3. Steel Mats - Perforated mats placed across perpendicular support members.

END OF SECTION

SECTION 01 55 26
TRAFFIC CONTROL

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Requirements for signs, signals, control devices, traffic barriers, flares, lights and traffic signals; construction parking control, designated haul routes, and bridging of trenches and excavations.

B. Qualifications and requirements for use of flagmen.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price Contracts. Include payment for work under this section in the total Stipulated Price.

1.3 REFERENCES

A. Texas Manual on Uniform Traffic Control Devices (TMUTCD).

B. Article 4413 (29bb), commonly referred to as Private Investigators and Private Security Agencies Act, and Article 2.12, Texas Code of Criminal Procedure.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Traffic control plan:
   1. If using traffic control plan contained in the Contract without modification, submit a letter confirming use of the plan.
   2. If using a different traffic control plan, submit the plan for approval to the local Governing Jurisdiction, Owner and Engineer. The plan must conform to TMUTCD requirements and be sealed by a Registered Texas Professional Engineer. The Contractor is responsible for obtaining approval from the Governing entity if using an alternate plan.

C. Submit copies of approved lane closure permits issued by all governmental authorities.

D. Submit Schedules of Values for traffic control plan and flagmen within 30 days following Notice to Proceed.

E. Submit records verifying qualifications of Uniformed Peace Officers and Certified Flagmen proposed for use on the Work.

1.5 FLAGMEN

A. Use Uniformed Peace Officers and Certified Flagmen to control movement of vehicular and pedestrian traffic when construction operations encroach on public traffic lanes.

B. Uniformed Peace Officer: Individual employed full-time as a peace officer who receives separate compensation as a privately employed flagman. Private employment may be an employee-employer relationship or on an individual basis. Flagman may not be in the employ of another peace officer nor be a reserve peace officer.
   1. Uniformed Peace Officers may be:
      a. Sheriffs and their deputies;
      b. Constables and deputy constables;
      c. Marshals or police officers of an incorporated city, town or village; or

d. As otherwise provided by Article 2.12, Code of Criminal Procedure.

2. The Uniformed Peace Officer must be a full-time peace officer, must work a minimum average of 32 paid hours per week, and must be paid a rate not less than the prevailing minimum hourly wage rate set by the federal Wage and Hour Act. The individual must be entitled to vacation, holidays, and insurance and retirement benefits.

C. Certified Flagman: Individual who receives compensation as a flagman and meets the following qualifications:
   1. Formally trained and certified in traffic control procedures by the City's E. B. Cape Center.
   2. Speaks English. Ability to speak Spanish is desirable but not required.
   3. Paid for flagman duty at an hourly rate not less than the wage rate set for Rough Carpenter under the City of Houston's Wage Scale for Engineering Construction.

D. Certified Flagmen must wear a distinctive uniform, bright-colored vest, and be equipped with appropriate flagging and communication devices while at the Work site. They must also have in their possession while on duty, a proof of training identification card issued by the appropriate training institute.

PART 2 P R O D U C T S

2.1 SIGNS, SIGNALS, AND DEVICES

A. Comply with TMUTCD requirements.

B. Traffic cones and drums, flares and lights: Conform to local jurisdictions' requirements.

2.2 PORTABLE LOW PROFILE CONCRETE BARRIERS

A. The low profile concrete barrier is a patented design. Information concerning this barrier may be obtained from Texas Transportation Institute, Texas A&M University System, College Station, Texas 77843-3135, (409) 845-1712.

PART 3 E X E C U T I O N

3.1 PUBLIC ROADS

A. Submit requests forms for lane closure and sidewalk closure to the appropriate governmental authority at least three working days prior to need for blocking vehicular lanes or sidewalks. Do not block lanes or sidewalks without approved permits.

B. Follow laws and regulations of governing jurisdictions when using public roads. Pay for and obtain permits from jurisdiction before impeding traffic or closing lanes. Coordinate activities with Owner's Representative.

C. Give Owner's Representative one-week notice before implementing approved traffic control phases. Inform local businesses of impending traffic control activities.

D. Notify police department, fire department, METRO, and local schools, churches, and businesses in writing a minimum of five business days prior to beginning work.

E. Maintain 10-foot-wide all-weather lanes adjacent to the Work for emergency vehicle use. Keep all-weather lanes free of construction equipment and debris.

F. Do not to obstruct normal flow of traffic from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. on designated major arterials or as directed by Owner's Representative.

G. Maintain local driveway access to residential and commercial properties adjacent to work areas at all times. Use all-weather materials approved by Owner's Representative to maintain temporary driveway access to commercial and residential driveways.

H. Keep streets entering and leaving job site free of excavated material, debris, and foreign material resulting from construction operations in compliance with applicable ordinances.

I. Remove existing signage and striping that conflict with construction activities or that may cause driver confusion.

J. Provide safe access for pedestrians along major cross streets.

K. Alternate closures of cross streets so that two adjacent cross streets are not closed simultaneously.

L. Do not close more than two consecutive esplanade openings at a time without prior approval from Owner's Representative.

3.2 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and the Owner's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.3 FLARES AND LIGHTS

A. Provide flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.4 HAUL ROUTES

A. Utilize haul routes designated by authorities or shown on Drawings for construction traffic.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.5 TRAFFIC SIGNS AND SIGNALS

A. Construct necessary traffic control devices for temporary signals required to complete the Work including loop detectors, traffic signal conduits, traffic signal wiring and crosswalk signals. Notify the governmental agency having jurisdiction a minimum of 60 days in advance of need for control boxes and switchgear. The Contractor will pay for all necessary service, programming or adjustments, to signal boxes and switchgear if required during construction.

B. Install and operate traffic control signals to direct and maintain orderly traffic flow in areas under Contractor's control affected by Contractor's operations. Post notices, signs and traffic controls before moving into next phase of traffic control.

C. Relocate traffic signs and signals as the Work progresses to maintain effective traffic control.

D. Unless otherwise approved by Owner's Representative, provide driveway signs with name of business that can be accessed from each crossover. Use two signs for each crossover.

E. Replace existing traffic control devices in Project area.

F. Owner's Representative may direct Contractor to make minor adjustments to traffic control signage to eliminate driver confusion and maintain orderly traffic flow during construction at no additional cost to the Owner.

3.6 BRIDGING TRENCHES AND EXCAVATIONS

A. When necessary, construct bridges over trenches and excavation to permit an unobstructed flow of traffic across construction areas and major drives. Use steel plates of sufficient thickness to support H-20 loading and install to operate with minimum noise.

B. Shore trench or excavation to support bridge and traffic.

C. Secure bridging against displacement with adjustable cleats, angles, bolts or other devices when:
1. Bridging is placed over existing bus routes,
2. More than five percent of daily traffic is comprised of commercial or truck traffic,
3. More than two separate plates are used for bridging, and
4. When bridge is to be used for more than five consecutive days.

D. Extend steel plates used for bridging a minimum of 1 foot beyond edges of trench or excavation. Use temporary paving materials such as premix to feather edges of plates to minimize wheel impact on secured bridging.

3.7 REMOVAL

A. Remove equipment and devices when no longer required.

B. Repair damage caused by installation.

C. Remove post settings to a depth of 2 feet.

3.8 TRAFFIC CONTROL, REGULATION AND DIRECTION

A. Use Flagmen to control, regulate and direct an even flow and movement of vehicular and pedestrian traffic, for periods of time as may be required to provide for public safety and convenience, where:
1. Multi-lane vehicular traffic must be diverted into single lane vehicular traffic,
2. Vehicular traffic must change lanes abruptly,
3. Construction equipment must enter or cross vehicular traffic lanes and walks,
4. Construction equipment may intermittently encroach on vehicular traffic lanes and unprotected walks and crosswalks,
5. Traffic regulation is needed due to rerouting of vehicular traffic around the Work site, and
6. Where construction activities might affect public safety and convenience.

B. Use of Flagmen to assist in the regulation of traffic flow and movement does not relieve Contractor of responsibility to take other means necessary to protect the Work and public.

3.9 INSTALLATION STANDARDS

A. Place temporary pavement for single lane closures, in accordance with TMUTCD.

B. Reinstall temporary and permanent pavement markings as approved by Owner's Representative. When weather conditions do not allow application according to manufacturer's requirements, alternate markings may be considered. Submit proposed alternate to Owner's Representative for approval prior to installation. No additional payment will be made for use of alternate markings.

3.10 MAINTENANCE OF EQUIPMENT AND MATERIAL

A. Submit name, address and telephone number of individual designated to be responsible for maintenance of traffic handling at construction site to Owner's Representative. Individual must be accessible at all times to immediately correct deficiencies in equipment and materials used to handle traffic including missing, damaged, or obscured signs, drums, barricades, or pavement markings.

B. Inspect signs, barricades, drums, lamps and temporary pavement markings daily to verify that they are visible, in good working order, and conform with traffic handling plans as approved by Owner's Representative. Immediately repair, clean, relocate, realign, or replace equipment or materials that are not in compliance.

C. Keep equipment and materials, signs and pavement markings, clean and free of dust, dirt, grime, oil, mud, or debris.

D. Obtain approval of Owner's Representative to reuse damaged or vandalized signs, drums, and barricades.

END OF SECTION

SECTION 01 56 39

TEMPORARY TREE PROTECTION & CARE

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION.

PART 1GENERAL

1.01 DESCRIPTION

A. Refer to Section AB-Instructions to Proposers, Section AF – Subcontractor/Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:

This section includes protection, tree removal, tree crown pruning, root pruning, temporary root protection matting, pest management, fertilization and watering of existing trees. This includes individual trees and groupings that are indicated to remain. Trees which are to remain and must be protected are indicated on the Drawings.

C. RELATED WORK IN OTHER SECTIONS

The following items of associated work are included in other sections of these specifications:
1. Site Clearing
2. Landscape planting

1.02 SUBMITTALS

A. Submit degreed Forester or arborist name for Owner approval and written documentation that this certified professional has been retained and will be performing and supervising the work. Locally pre-approved ; 1. Bartlett; 2.Yellowstone Tree Care; 3. Champions Tree Services

B. If needed, submit shop drawings/cut sheets and material samples for the specified Temporary Root Protection Matting.

1.03 GENERAL PROVISIONS

A. Arborist Qualifications: Engage a qualified ISA certified arborist or degreed Foresters who has successfully completed tree protection, trimming and root pruning work. Membership in professional organization such as the International Society of Arboriculture (ISA), the Tree Care Industry Association (TCIA), the American Society of Consulting Arborists (ASCA) are required, as well as proof of insurance and compliance with applicable OSHA regulations and industry standards.

B. Temporary Tree Protection: Provide temporary fencing outside drip line/c (outer perimeter of branches) to protect the critical root zone against damage for the trees that are to remain.

C. Protect Root Systems: Do not store construction materials, debris, or excavated materials within drip line. Restrict foot traffic and equipment to prevent excessive compaction of soil over root zone. This zone shall also be protected against erosion, siltation and leaching of lime and other detrimental materials into the protected areas.

1.04 QUALITY ASSURANCE

A. Contractor to participate in a pre-installation meeting with Owners Representative prior to the start of all site construction work.

B. Contractor to identify all existing trees to be removed and to remain for Owner approval prior to tree removal.

C. Any conflicts between Tree Protection and Clearing and Grubbing or Demolition should be brought to the attention of the Project Manager, Architect and Landscape Architect prior to tree removal.

PART 2 - PRODUCTS

2.01 MATERIALS

A. New sandy topsoil: fertile, friable, surface soil containing natural loam. Obtain from local sources. Provide topsoil that is free of subsoil and clay lumps, and free of brush, weeds, roots, stones larger than 2 inches in any dimension and free of other extraneous or toxic matter harmful to plant growth.
B. Tree Protection Fencing: 6' ht. temporary above grade chain link panels.
C. Plastic sheeting to be installed vertically to protect exposed roots from leaching lime during stabilization process.
D. Temporary Root Protection Matting (if needed): geocomposite material comprised of a tri-planar geonet structure with thermally bonded nonwoven geotextiles on both sides. Material shall be Tenax PoaDrain or Tenax Tendrain II 770-2.
E. Coarse shredded wood mulch.
F. Tree Protection Signs: affixed to all tree protection fencing or separate stakes but shall not be affixed directly to trees. Signs to be bilingual in English and Spanish.

PART 3 - EXECUTION

3.01 GENERAL

A. Protect tree root systems from damage due to noxious materials caused by run off or spillage during mixing, placement and/or storage of construction materials. Protect root systems from flooding, eroding or excessive wetting and lime stabilization process.

B. Remove branches, if required to clear new construction and for overhead clearance for equipment access. Cut branches and roots, if required, with sharp, clean pruning instruments; do not break or chop.

3.02 TREE PROTECTION

A. Tree protection fencing shall be 6' ht chain link fencing constructed at or beyond the tree drip line of the existing trees to remain. **See plan for each area.**
B. The fencing shall remain in place throughout all of the project construction. Contractor shall provide maintenance and repair of fence during site work.

3.03 TREE REMOVAL

A. Within the tree protection area, vines and underbrush shall be removed.
B. Grind stumps to 6” below grade. Wood chips to remain on site unless otherwise specified or directed.
C. Dead trees within the tree protection area shall be removed. This includes dead trees at the beginning, at the end of the construction period and up to 6 months after Substantial Completion.

3.04 CONSTRUCTION CLEARANCE PRUNING

A. Pruning for specific clearance (construction access or proposed improvements) shall be reviewed and approved by the Landscape Architect.
B. Work shall be completed prior to the start of construction.
C. Existing tree canopies in conflict with construction shall be professionally pruned to remove the limbs in question, but shall not under any circumstances be broken off with construction

equipment.

3.05 TREE CANOPY PRUNING

A. Trees that are protected with fencing shall be canopy pruned in accordance with ANSI A-300 Pruning Standards and ISA Best management Practices. At a minimum, pruning shall consist of removal of dead, dying, diseased, interfering, objectionable and weak branches on the main trunks as well as those within the leaf area.
B. All vines and tree suckers to be removed.
C. All tree branches shall be removed from the ground to 6' height clearance.
D. Work accomplished under the direction of an experienced ISA certified arborist or degreed forester only.

3.06 ROOT PRUNING

A. Root prune only if required for new construction conflict. Work to be confirmed and performed by Arborist.
B. Roots can be pruned using a small trencher to cut a narrow trench to a depth of two feet. The trench should be backfilled immediately and watered to remove air pockets from the soil and to moisten the roots.
C. Work accomplished under the direction of an experienced ISA certified arborist or degreed forester only.

3.07 DEEP ROOT FEEDING AND INSECT CONTROL

A. Deep root feed existing trees to remain a minimum of two feedings.
B. Treat or pre-treat for any insect infestation and monitor throughout the construction process.

3.08 ROOT PROTECTON MATTING

A. Root Matting is required for existing trees anticipated to be within the work/construction zone. This includes temporary or repetitive materials staging, foot traffic, equipment access and construction access. Forester / arborist to help determine if matting is recommended.
B. The matting will reduce the compaction, rutting and contamination of the soils within the critical root zone of the existing trees.
C. Coarse shredded wood mulch at a depth of 4”-6” shall be installed under matting.
D. Depending on the duration and extent of the construction, a stone layer may be advisable over the temporary matting. This determination will be made by/with the arborist/forester recommendation and is consider a part of this scope of work.

3.09 SUPPLEMENTAL WATERING

A. Supplemental watering may be required within the tree protection zone throughout construction. As directed and advised by the arborist/forester, the contractor will supply water to the trees.

3.10 EXCAVATION AROUND TREES

A. Use alternate route around trees when possible. If not possible, excavate within proximity of trees only where indicated. Do not machine excavate within drip line.
B. Where excavating for new construction is required within drip line of trees, hand excavate to minimize damage to root system. Use narrow-tine spading forks and comb soil to expose

roots. Tunnel under or around roots by hand digging.

C. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

3.11 GRADING AND FILLING AROUND TREES

A. Maintain existing grade within the drip line of trees.

B. Minor fills: Use sandy topsoil fill material as specified to fill a maximum of 2 inches over roots a year. Place in single layer and do not compact; hand grade to required finished elevations.

3.12 CLEAN UP

A. All temporary matting and fencing shall be removed at the completion of the project.

3.13 REPAIR AND REPLACEMENT OF TREES

A. Repair trees damaged by construction operations. Make repairs promptly after damage occurs to prevent progressive deterioration.

B. When trees other than those designated for removal are destroyed, or badly damaged as a result of construction operations, remove and replace with same size, species and variety up to and including 8" caliper or multiples of to reach and equal the caliper size tree lost. Contractor shall plant, maintain and warranty all new trees as per Landscape Planting Section.

3.14 DISPOSAL

A. Burning on Owner's property of removed trees and branches is not permitted on site.

B. Removal from Owner's property: Remove excess excavation, displaced trees, and trimmings and dispose of off Owner's property in accordance with local ordinances.

END OF SECTION

SECTION 01 57 10
TPDES REQUIREMENTS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Documentation to be prepared and signed by Contractor before conducting construction operations, in accordance with the Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit Number TXR 150000 (the Construction General Permit).

B. Implementation, maintenance, inspection, and termination of storm water pollution prevention control measures including, but not limited to, erosion and sediment controls, storm water management plans, waste collection and disposal, off-site vehicle tracking, and other appropriate practices shown on the Drawings or specified elsewhere in the Contract.

C. Review of the Storm Water Pollution Prevention Plan (SWP3) implementation in a meeting with the Owner's Representative prior to start of construction.

1.2 DEFINITIONS

A. Commencement of Construction Activities: The exposure of soil resulting from activities such as clearing, grading, and excavating.

B. Large Construction Activity: Project that:
1. Disturbs five acres or more, or
2. Disturbs less than five acres but is part of a larger common plan of development that will disturb five acres or more of land.

C. Small Construction Activity: Project that:
1. Disturbs one or more acres but less than five acres, or
2. Disturbs less than one acre but is part of a larger common plan of development that will ultimately disturb one or more acres but less than five acres.

D. TPDES Operator:
1. The person or persons who have day-to-day operational control of the construction activities which are necessary to ensure compliance with the SWP3 for the site or other Construction General Permit conditions.

PART 2 P R O D U C T S - Not Used

PART 3 E X E C U T I O N

3.1 SITE SPECIFIC STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. Prepare a SWP3 following Part III of the Construction General Permit and the applicable local code. If conflicts exist between the Construction General Permit and the local regulations, the more stringent requirements will apply.

B. Update or revise the SWP3 as needed during the construction following Part III, Section E of the Construction General Permit.

C. Submit the SWP3 and any updates or revisions to the Owner's Representative for review and address comments prior to commencing, or continuing, construction activities.

3.2 NOTICE OF INTENT FOR LARGE CONSTRUCTION ACTIVITY

A. Fill out, sign, and date TCEQ Form 20022 Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under the TPDES Construction General Permit (TXR 150000). Contractor shall provide NOI forms for both himself and Owner.

B. Transmit the signed Contractor's copy of TCEQ Form 20022, along with a check for the required fee, made out to Texas Commission on Environmental Quality.

C. Submission of the Notice of Intent form by the Contractor to TCEQ is required a minimum of fourteen days before Commencement of Construction Activities.

3.3 CONSTRUCTION SITE NOTICE FOR SMALL CONSTRUCTION ACTIVITY

A. Fill out, sign, and date the Construction Site Notice, Attachment 2 to TPDES General Permit TXR 150000, "Construction Site Notice."

B. Transmit the signed Construction Site Notice to the Engineer and Owner at least seven days prior to Commencement of Construction Activity.

3.4 CERTIFICATION REQUIREMENTS

A. Conduct inspections in accordance with TCEQ requirements. Ensure persons or firms responsible for maintenance and inspection of erosion and sediment control measures read, fill out, sign, and date the Erosion Control Contractor's Certification for Inspection and Maintenance. Use the EPA NPDES Construction Inspection Form.

3.5 RETENTION OF RECORDS

A. Keep a copy of this document and the SWP3 in a readily accessible location at the construction site from Commencement of Construction Activity until submission of the Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under TPDES Construction General Permit (TXR 150000). Contractors with day-to-day operational control over SWP3 implementation shall have a copy of the SWP3 available at a central location, on-site, for the use of all operators and those identified as having responsibilities under the SWP3. Upon submission of the NOT, submit all required forms and a copy of the SWP3 with all revisions to the Owner's Representative.

3.6 REQUIRED NOTICES

A. Post the following notices from effective date of the SWP3 until date of final site stabilization as defined in the Construction General Permit:
   1. Post the TPDES permit number for Large Construction Activity or a signed TCEQ Construction Site Notice for Small Construction Activity. A signed copy of the Contractor's NOI must also be posted.
   2. Post notices near the main entrance of the construction site in a prominent place for public viewing. Post name and telephone number of Contractor's local contact person, brief project description and location of the SWP3.
      a. If posting near a main entrance is not feasible due to safety concerns, coordinate posting of notice with the Owner's Representative to conform to requirements of the Construction General Permit.
      b. If Project is a linear construction project (e.g.: road, utilities, etc.), post notice in a publicly accessible location near active construction. Move notice as necessary.
   3. Post a notice to equipment and vehicles operators, instructing them to stop, check, and clean tires of debris and mud before driving onto traffic lanes. Post at each stabilized construction exit area.
   4. Post a notice of waste disposal procedures in a readily visible location on site.

3.7 ON-SITE WASTE MATERIAL STORAGE

A. On-site waste material storage shall be self-contained and shall satisfy appropriate local, state, and federal rules and regulations.

B. Prepare list of waste material to be stored on-site. Update list as necessary to include up to-date information. Keep a copy of updated list with the SWP3.

C. Prepare description of controls to reduce pollutants generated from on-site storage. Include storage practices necessary to minimize exposure of materials to storm water, and spill prevention and response measures consistent with best management practices. Keep a copy of the description with the SWP3.

3.8 NOTICE OF TERMINATION

A. Submit a NOT to TCEQ and the Engineer within 30 days after:
   1. Final stabilization has been achieved on all portions of the site that are the responsibility of the Contractor; or
   2. Another operator has assumed control over all areas of the site that have not been stabilized; and
   3. All silt fences and other temporary erosion controls have either been removed, scheduled to be removed as defined in the SWP3, or transferred to a new operator if the new operator has sought permit coverage.

END OF SECTION

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Dewatering, depressurizing, draining, and maintaining trenches, shaft excavations, structural excavations and foundation beds in stable condition, and controlling ground water conditions for tunnel excavations.

B. Protecting work against surface runoff and rising floodwaters.

C. Trapping suspended sediment in the discharge form the surface and ground water control systems.

PART 2 MEASUREMENT AND PAYMENT

2.1 UNIT PRICES

A. Stipulated Price (Lump Sum) Contract. If the Contract is a Stipulated Price Contract, include payment for work under this section in the total Stipulated Price.

2.2 REFERENCES

A. ASTM D 698 - Standard Test Methods for Laboratory Compaction of Soils Using Standard Effort (12,400 ft-lbf/ft3 (600kN-m/m3).

B. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

C. Storm Water Management Handbook for Construction Activities prepared by City of Houston, Harris County and Harris County Flood Control District.

2.3 DEFINITIONS

A. Ground water control system: system used to dewater and depressurize water-bearing soil layers.
   1. Dewatering: lowering the water table and intercepting seepage that would otherwise emerge from slopes or bottoms of excavations, or into tunnels and shafts; and disposing of removed water. Intent of dewatering is to increase stability of tunnel excavations and excavated slopes, prevent dislocation of material from slopes or bottoms of excavations, reduce lateral loads on sheeting and bracing, improve excavating and hauling characteristics of excavated material, prevent failure or heaving of bottom of excavations, and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.
   2. Depressurization: includes reduction in piezometric pressure within strata not controlled by dewatering alone, necessary to prevent failure or heaving of excavation bottom or instability of tunnel excavations.

B. Excavation drainage: includes keeping excavations free of surface and seepage water.

C. Surface drainage: includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines necessary to protect Work from any source of surface water.

D. Monitoring facilities for ground water control system: includes piezometers, monitoring wells and flow meters for observing and recording flow rates.

2.4 PERFORMANCE REQUIREMENTS

A. Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems. Submit proposed method and spacing of readings for review prior to obtaining water level readings.

B. Design ground water control system, compatible with requirements of Federal Regulations 29 CFR Part 1926 and Division 2 to produce following results:
   1. Effectively reduce hydrostatic pressure affecting:
      a. Excavations.
      b. Tunnel excavation, face stability or seepage into tunnels.
   2. Develop substantially dry and stable subgrade for subsequent construction operations.
   3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities and other work.
   4. Prevent loss of fines, seepage, boils, quick condition, or softening of foundation strata.
   5. Maintain stability of sides and bottom of excavations.

C. Provide ground water control systems that include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.

D. Provide drainage of seepage water and surface water, as well as water from other sources entering excavation. Excavation drainage may include placement of drainage materials, crushed stone and filter fabric, together with sump pumping.

E. Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.

F. Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

G. Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, adjacent water wells, or potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of system to protect property as required.

H. Install an adequate number of piezometers installed at proper locations and depths, necessary to provide meaningful observations of conditions affecting excavation, adjacent structures and water wells.

I. Install environmental monitoring wells at proper locations and depths necessary to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into work area or ground water control system.

2.5 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit Ground Water and Surface Water Control Plan for review by Owner’s Representative prior to start of excavation work. Include the following:
   1. Results of subsurface investigations and description of extent and characteristics of water bearing layers subject to ground water control.
   2. Names of equipment Suppliers and installation Subcontractors.

3. Description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria and operation and maintenance procedures.
4. Description of proposed monitoring facilities indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.
5. Description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.
6. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.
7. Operating requirements, including piezometric control elevations for dewatering and depressurization.
8. Excavation drainage methods including typical drainage layers, sump pump application and other means.
9. Surface water control and drainage installations.
10. Proposed methods and locations for disposing of removed water.

C. Submit following records upon completion of initial installation:
1. Installation and development reports for well points, eductors, and deep wells.
2. Installation reports and baseline readings for piezometers and monitoring wells.
3. Baseline analytical test data of water from monitoring wells.
4. Initial flow rates.

D. Submit the following records weekly during control of ground and surface water operations:
1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to Paragraph 3.02, Requirements for Eductor, Well Points, or Deep Wells.
2. Maintenance records for ground water control installations, piezometers and monitoring wells.

2.6 ENVIRONMENTAL REQUIREMENTS

A. Comply with requirements of agencies having jurisdiction.

B. Comply with Texas Commission on Environmental Quality regulations and Texas Water Well Drillers Association for development, drilling, and abandonment of wells used in dewatering system.

C. Obtain necessary permits from agencies with jurisdiction over use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Since review and permitting process may be lengthy, take early action to obtain required approvals.

D. Monitor ground water discharge for contamination while performing pumping in vicinity of potentially contaminated sites.

PART 3 P R O D U C T S

3.1 EQUIPMENT AND MATERIALS

A. Select equipment and materials necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review by Owner’s Representative through submittals required in Paragraph 1.06, Submittals.

B. Use experienced contractors, regularly engaged in ground water control system design, installation, and operation, to furnish and install and operate eductors, well points, or deep wells, when needed.

C. Maintain equipment in good repair and operating condition.

D. Keep sufficient standby equipment and materials available to ensure continuous operation, where required.

E. Portable Sediment Tank System: Standard 55-gallon steel or plastic drums, free of hazardous material contamination.
   1. Shop or field fabricate tanks in series with main inlet pipe, inter-tank pipes and discharge pipes, using quantities sufficient to collect sediments from discharge water.

PART 4 E X E C U T I O N

4.1 GROUND WATER CONTROL

A. Perform necessary subsurface investigation to identify water bearing layers, piezometric pressures and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine draw down characteristics. Present results in the Ground Water and Surface Water Control Plan submittal.

B. Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in manner compatible with construction methods and site conditions. Monitor effectiveness of installed system and its effect on adjacent property.

C. Install, operate, and maintain ground water control systems in accordance with the Ground Water and Surface Water Control Plan. Notify Owner's Representative in writing of changes made to accommodate field conditions and changes to Work. Provide revised drawings and calculations with notification.

D. Provide continuous system operation, including nights, weekends, and holidays. Arrange appropriate backup if electrical power is primary energy source for dewatering system.

E. Monitor operations to verify systems lower ground water piezometric levels at rate required to maintain dry excavation resulting in stable subgrade for subsequent construction operations.

F. Depressurize zones where hydrostatic pressures in confined water bearing layers exist below excavations to eliminate risk of uplift or other instability of excavation or installed works. Define allowable piezometric elevations in the Ground Water and Surface Water Control Plan.

G. Removal of ground water control installations.
   1. Remove pumping system components and piping when ground water control is no longer required.
   2. Remove piezometers, including piezometers installed during design phase investigations and left for Contractor's use, upon completion of testing, as required in accordance with Part 3 of applicable specification.
   3. Remove monitoring wells when directed by Owner's Representative.
   4. Grout abandoned well and piezometer holes. Fill piping that is not removed with cement-bentonite grout or cement-sand grout.

H. During backfilling, maintain water level a minimum of 5 feet below prevailing level of backfill. Do not allow the water level to cause uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement-stabilized sand until at least 48 hour after placement.

I. Provide uniform pipe diameter for each pipe drain run constructed for dewatering. Remove pipe drains when no longer required. If pipe removal is impractical, grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout after removal from service.

J. The extent of ground water control for structures with permanent perforated underground drainage systems may be reduced, for units designed to withstand hydrostatic uplift pressure. Provide a means to drain affected portions of underground systems, including standby equipment. Maintain drainage systems during construction operations.

K. Remove systems upon completion of construction or when dewatering and control of surface or ground water is no longer required.

L. Compact backfill to not less than 95 percent of maximum dry density in accordance with ASTM D 698.

M. Foundation Slab: Maintain saturation line at least 3 feet below lowest elevations where concrete is to be placed. Drain foundations in areas where concrete is to be placed before placing reinforcing steel. Keep free from water for 3 days after concrete is placed.

4.2 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

A. For above ground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between each eductor well or well point and discharge header to allow visual monitoring of discharge from each installation.

B. Install sufficient piezometers or monitoring wells to show that trench or shaft excavations in water bearing materials are pre-drained prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for selected method of work.

C. Install piezometers or monitoring wells at least one week in advance of the start of associated excavation.

D. Dewatering may be omitted for portions of under drains or other excavations, where auger borings and piezometers or monitoring wells show that soil is pre-drained by existing systems and that ground water control plan criteria are satisfied.

E. Replace installations that produce noticeable amounts of sediments after development.

F. Provide additional ground water control installations, or change method of control if, ground water control plan does not provide satisfactory results based on performance criteria defined by plan and by specifications. Submit revised plan according to Paragraph 1.6B.

4.3 SEDIMENT TRAPS

A. Install sediment tank as shown on approved plan.

B. Inspect daily and clean out tank when one-third of sediment tank is filled with sediment.

4.4 SEDIMENT SUMP PIT

A. Install sediment sump pits as shown on approved plan.

B. Construct standpipe by perforating 12 inch to 24-inch diameter corrugated metal or PVC pipe.

C. Extend standpipe 12 inches to 18 inches above lip of pit.

D. Convey discharge of water pumped from standpipe to sediment trapping device.

E. Fill sites of sump pits, compact to density of surrounding soil and stabilize surface when construction is complete.

4.5 EXCAVATION DRAINAGE

A. Use excavation drainage methods if well-drained conditions can be achieved. Excavation drainage may consist of layers of crushed stone and filter fabric, and sump pumping, in combination with sufficient ground water control wells to maintain stable excavation and backfill conditions.

4.6 MAINTENANCE AND OBSERVATION

A. Conduct daily maintenance and observation of piezometers or monitoring wells while ground water control installations or excavation drainage is operating at the site, or water is seeping into tunnels, and maintain systems in good operating condition.

B. Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedules.

C. Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make specified observations.

D. Remove and grout piezometers inside or outside of excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by Owner's Representative.

4.7 MONITORING AND RECORDING

A. Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also, monitor and record water level and ground water recovery. Record observations daily until steady conditions are achieved and twice weekly thereafter.

B. Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until Work is completed or piezometers or wells are removed, except when Owner's Representative determines more frequent monitoring and recording are required. Comply with Owner's Representative's direction for increased monitoring and recording and take measures necessary to ensure effective dewatering for intended purpose.

4.8 SURFACE WATER CONTROL

A. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. Requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.

B. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by agencies.

END OF SECTION

SECTION 01 57 23
TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Implementation of Storm Water Pollution Prevention Plans (SWP3) described in Division 1.

B. Installation and maintenance of storm-water pollution prevention structures: diversion dikes, interceptor dikes, diversion swales, interceptor swales, down spout extenders, pipe slope drains, paved flumes and level spreaders. Structures are used during construction and prior to final development of the site.

C. Filter Fabric Fences:
   1. Type 1: Temporary filter fabric fences for erosion and sediment control in non-channelized flow areas.
   2. Type 2: Temporary reinforced filter fabric fences for erosion and sediment control in channelized flow areas.

D. Straw Bale Fence.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum) Contract. If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.3 REFERENCE STANDARDS

A. ASTM
   1. A 36 - Standard Specification for Carbon Structural Steel.
   2. D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort [12,400 ft-lbf/ft3 (600 kN-m/m3)].
   3. D3786 - Standard Test Method for Hydraulic Bursting Strength for Knitted Goods and Nonwoven Fabrics.
   4. D 4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
   5. D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
   6. D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
   7. D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
   8. D 6382 - Standard Practice for Dynamic Mechanical Analysis and Thermogravimetry of Roofing and Waterproofing Membrane Material.

B. Storm Water Management Handbook for Construction Activities prepared by City of Houston, Harris County and Harris County Flood Control District.

1.4 SYSTEM DESCRIPTIONS

A. Filter Fabric Fence Type 1 and Type 2: Install to allow surface or channel runoff percolation through fabric in sheet-flow manner and to retain and accumulate sediment. Maintain Filter Fabric Fences to remain in proper position and configuration at all times.

B. Interceptor Dikes and Swales: Construct to direct surface or channel runoff around the project area or runoff from project area into sediment traps.

C. Drop Inlet Baskets: Install to allow runoff percolation through the basket and to retain and accumulate sediment. Clean accumulation of sediment to prevent clogging and backups.

D. Sediment traps: Construct to pool surface runoff from construction area to allow sediment to settle onto the bottom of trap.

1.5 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit manufacturer's literature for product specifications and installation instructions.

C. Submit manufacturer’s catalog sheets and other product data on geotextile or filter fabrics, outlet pipe, perforated riser and connectors.

D. Submit proposed methods, equipment, materials, and sequence of operations for storm-water pollution prevention structures.

E. Submit shop drawings for Drop Inlet Baskets.

PART 2 P R O D U C T S

2.1 CONCRETE

A. Concrete: Class B in accordance with Division 32 or as shown on the Drawings.

2.2 AGREGATE MATERIALS

A. Use poorly graded cobbles with diameter greater than 2 inches and less than 5 inches.

B. Provide gravel lining in accordance with Division 31 or as shown on the drawings.

C. Provide clean cobbles and gravel consisting of crushed concrete or stone. Use clean, hard crushed concrete or stone free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic matter.

D. Sediment Pump Pit Aggregate: Use nominal 2-inch diameter river gravel.

2.3 PIPE

A. Polyethylene culvert pipe or PVC sewer pipe in accordance with Division 33 or as shown on the Drawings.

B. Inlet Pipes: Galvanized steel pipe in accordance with Division 33 or as shown on the Drawings.

C. Standpipe for Sediment Pump Pits: Galvanized round culvert pipe or round PVC pipe, minimum of 12-inch and a maximum of 24-inch diameter, perforate at 6 to 12 inch centers around circumference.

2.4 GEOTEXTILE FILTER FABRIC

A. Woven or nonwoven geotextile filter fabric made of either polypropylene, polyethylene, ethylene, or polyamide material, in continuous rolls of longest practical length.

B. Grab Strength: 100 psi in any principal direction (ASTM D-4632), Mullen burst strength >200 psi (ASTM D-3786), and equivalent opening size between 50 and 140.

C. Furnish ultraviolet inhibitors and stabilizers for minimum 6 months of expected usable construction life at temperature range of 0 degrees F to 120 degrees F.

D. Mirafi, Inc., Synthetic Industries, or equivalent.

2.5 FENCING

A. Wire Fencing: Woven galvanized steel wire, 14 gauge by 6-inch square mesh spacing, minimum 24 inch roll or sheet width of longest practical length.

B. Fence Stakes: Nominal 2 x 2 inch moisture-resistant treated wood or steel posts (min. of 1.25 lbs. per linear foot and Brinell Hardness greater than 140) with safety caps on top; length as required for minimum 12 inch bury and full height of filter fabric.

2.6 SANDBAGS

A. Provide woven material made of polypropylene, polyethylene, or polyamide material.
   1. Minimum unit weight of four ounces per square yard.
   2. Minimum grab strength of 100 psi in any principal direction (ASTM D4632).
   3. Mullen burst strength exceeding 300 psi (ASTM D3786).
   4. Ultraviolet stability exceeding 70 percent.
   5. Size: Length: 18 to 24 inches. Width: 12 to 18 inches. Thickness: 6 to 8 inches. Weight: 50 to 125 pounds.

2.7 DROP INLET BASKET

A. Provide steel frame members in accordance with ASTM A36.

B. Construct top frame of basket with two short sides of 2 inch by 2 inch and single long side of 1 inch by 1 inch, 1/8 inch angle iron. Construct basket hangers of 2 inch by 1/4 inch iron bars. Construct bottom frame of 1 inch by 1/4 inch iron bar or 1/4 inch plate with center 3 inches removed. Use minimum 1/4 inch diameter iron rods or equivalent for sides of inlet basket. Weld minimum of 14 rods in place between top frame/basket hanger and bottom frame. Exact dimensions for top frame and insert basket will be determined based on dimensions of type of inlet being protected.

PART 3 E X E C U T I O N

3.1 PREPARATION, INSTALLATION AND MAINTENANCE

A. Provide erosion and sediment control structures at locations shown on the Drawings.

B. Do not clear, grub or rough cut until erosion and sediment control systems are in place unless approved by Project Manger to allow installation of erosion and sediment control systems, soil testing and surveying.

C. Maintain existing erosion and sediment control systems located within project site until acceptance of Project or until directed by Project Manger to remove and discard existing system.

D. Regularly inspect and repair or replace damaged components of erosion and sediment control structures. Unless otherwise directed, maintain erosion and sediment control structure until project area stabilization is accepted. Re-dress and replace granular fill at outlets as needed to replenish depleted granular fill. Remove erosion and sediment control structures promptly when directed by Project Manger. Dispose of materials in accordance with Division 1.

E. Remove and dispose sediment deposits at the designated spoil site for the Project. If a project spoil site is not designated on Drawings, dispose of sediment off site at approved location in accordance with Division 1.

F. Unless otherwise shown on the Drawings, compact embankments, excavations, and trenches in accordance with Division 31.

G. Prohibit equipment and vehicles from maneuvering on areas outside of dedicated right of way and easements for construction. Immediately repair damage caused by construction traffic to erosion and sediment control structures.

H. Protect existing trees and plants in accordance with Division 1.

3.2 SEDIMENT TRAPS

A. Install sediment traps so that surface runoff shall percolate through system in sheet flow fashion and allow retention and accumulation of sediment.

B. Inspect sediment traps after each rainfall, daily during periods of prolonged rainfall, and at a minimum once each week. Repair or replace damaged sections immediately.

C. Use fill material for embankment in accordance with Division 31.

D. Excavation length and height shall be as specified on Drawings. Use side slopes of 2:1 or flatter.

E. Stone outlet sediment traps:
1. Maintain minimum of 6 inches between top of core material and top of stone outlet, minimum of 4 inches between bottom of core material and existing ground and minimum of 1 foot between top of stone outlet and top of embankment.
2. Embed cobbles minimum of 4 inches into existing ground for stone outlet. Core shall be a minimum of 1 foot in height and in width and wrapped in triple layer of geotextile filter fabric.

F. Sediment Basin with Pipe Outlet Construction Methods: Install outlet pipe and riser as shown on the Drawings.

G. Remove sediment deposits when design basin volume is reduced by one-third or sediment level is one foot below principal spillway crest, whichever is less.

3.3 FILTER FABRIC FENCE CONSTRUCTION METHODS

A. Fence Type 1
1. Install stakes 6 feet on center maximum and firmly embed minimum 12 inches in soil. If filter fabric is factory pre-assembled with support netting, then maximum support spacing is 8 feet. Install wood stakes at a slight angle toward the source of anticipated runoff.
2. Trench in the toe of the fence lines so the downward face of the trenches is flat and perpendicular to direction of flow. V-trench configuration as shown on Drawings may also be used.
3. Lay fabric along edges of trenches in longest practical continuous runs to minimize joints. Make joints only at a support post. Splice with minimum 6-inch overlap and seal securely.
4. Staple filter fabric to stakes at maximum 3 inches on center. Extend fabric minimum 18 inches and maximum 36 inches above natural ground.
5. Backfill and compact trench.

B. Fence Type 2
1. Layout fence same as for Type 1.
2. Install stakes at 6 feet on center maximum and at each joint in wire fence, firmly embedded 1-foot minimum, and inclined it as for Type 1.
3. Tie wire fence to stakes with wire at 6 inches on center maximum. Overlap joints minimum one bay of mesh.
4. Install trench same as for Type 1.
5. Fasten filter fabric wire fence with tie wires at 3 inches on center maximum.

6. Layout fabric same as for Type 1. Fasten to wire fence with wire ties at 3 inches on center maximum and, if applicable, to stakes above top of wire fence it as for Type 1.
7. Backfill and compact trench.

C. Attach filter fabric to wooden fence stakes spaced a maximum of 6 feet apart or steel fence stakes spaced a maximum of 8 feet apart and embedded a minimum of 12 inches. Install stakes at a slight angle toward source of anticipated runoff.

D. Trench in toe of filter fabric fence with spade or mechanical trencher so that downward face of trench is flat and perpendicular to direction of flow. A V-trench configuration may also be used. Lay filter fabric along edges of trench. Backfill and compact trench upon completion of Construction.

E. Filter fabric fence shall have a minimum height of 18 inches and a maximum height of 36 inches above natural ground.

F. Cut length of fence to minimize use of joints. When joints are necessary, splice fabric together only at support post with minimum 6 inch overlap and seal securely.

G. Triangular Filter Fabric Fence Construction Methods:
1. Attach filter fabric to wire fencing, 18 inches on each side. Provide a fabric cover and skirt with continuous wrapping of fabric. Skirt should form continuous extension of fabric on upstream side of fence.
2. Secure triangular fabric filter fence in place using one of the following methods:
   a. Toe-in skirt 6 inches with mechanically compacted material;
   b. Weight down skirt with continuous layer of 3-inch to 5-inch graded rock; or
   c. Trench-in entire structure 4 inches.
3. Anchor triangular fabric filter fence structure and skirt securely in place using 6-inch wire staples on 2-foot centers on both edges and on skirt, or staked using 18-inch by 3/8-inch diameter re-bar with tee ends.
4. Lap fabric filter material by 6 inches to cover segment joints. Fasten joints with galvanized shoat rings.

H. Reinforced Filter Fabric Barrier Construction Methods:
1. Attach woven wire fence to fence stakes.
2. Securely fasten filter fabric material to wire fence with tie wires.
3. When used in swales, ditches or diversions, elevation of barrier at top of filter fabric at flow line location in channel shall be lower than bottom elevation of filter fabric at ends of barrier or top of bank, whichever is less, in order to keep storm water discharge in channel from overtopping bank.
4. Remove sediment deposits when silt reaches depth one-third height of barrier or 6 inches, whichever is less.

3.4 DIKE AND SWALE

A. Unless otherwise indicated, maintain minimum dike height of 18 inches, measured from cleared ground at up slope toe to top of dike. Maintain side slopes of 2:1 or flatter.

B. Dike and Swale Stabilization: When shown on the Drawings, place gravel lining 3 inches thick and compacted into the soil or 6 inches thick if truck crossing is expected. Extend gravel lining across bottom and up both sides of swale minimum height of 8 inches vertically, above bottom. Gravel lining on dike side shall extend up the up slope side of dike a minimum height of 8 inches, measured vertically from interface of existing or graded ground and up slope toe of dike, as shown on Drawings.

C. Divert flow from dikes and swales to sediment basins, stabilized outlets, or sediment trapping devices of types and at locations shown on Drawings. Grade dikes and swales as

shown on Drawings, or, if not specified, provide positive drainage with maximum grade of 1 percent to outlet or basin.

D. Clear in accordance with Division 31.

E. Carry out excavation for swale construction so that erosion and water pollution is minimal. Minimum depth shall be 1 foot and bottom width shall be 4 feet, with level swale bottom. Excavation slopes shall be 2:1 or flatter. Clear, grub and strip excavation area of vegetation and root material.

3.5 DOWN SPOUT EXTENDER

A. Down spout extender shall have slope of approximately 1 percent. Use pipe diameter of 4 inches or as shown on the Drawings. Place pipe in accordance with Division 33.

3.6 PIPE SLOPE DRAIN

A. Compact soil around and under drain entrance section to top of embankment in lifts appropriately sized for method of compaction utilized.

B. Inlet pipe shall have slope of 1 percent or greater. Use pipe diameter as shown on the Drawings.

C. Top of embankment over inlet pipe and embankments directing water to pipe shall be at least 1 foot higher at all points than top of inlet pipe.

D. Pipe shall be secured with hold-down grommets spaced 10 feet on centers.

E. Place riprap apron with a depth equal to pipe diameter with 2:1 side slopes.

3.7 PAVED FLUME

A. Compact soil around and under the entrance section to top of the embankment in lifts appropriately sized for method of compaction utilized.

B. Construct subgrade to required elevations. Remove and replace soft sections and unsuitable material. Compact subgrade thoroughly and shape to a smooth, uniform surface.

C. Construct permanent paved flumes in accordance with Drawings.

D. Remove sediment from riprap apron when sediment has accumulated to depth of one foot.

3.8 LEVEL SPREADER

A. Construct level spreader on undisturbed soil and not on fill. Ensure that spreader lip is level for uniform spreading of storm runoff.

B. Maintain at required depth, grade, and cross section as specified on Drawings. Remove sediment deposits as well as projections or other irregularities which will impede normal flow.

3.9 INLET PROTECTION BARRIER

A. Place sandbags and filter fabric fences at locations shown on the SWP3.

3.10 DROP INLET BASKET CONSTRUCTION METHODS.

A. Fit inlet insert basket into inlet without gaps around insert at locations shown on the SWP3.

B. Support for inlet insert basket shall consist of fabricated metal as shown on Drawings.

C. Push down and form filter fabric to shape of basket. Use sheet of fabric large enough to be supported by basket frame when holding sediment and extend at least 6 inches past frame. Place inlet grates over basket/frame to serve as fabric anchor.

D. Remove sediment deposit after each storm event and whenever accumulation exceeds 1-inch depth during weekly inspections.

3.11 BRUSH BERM CONSTRUCTION METHODS

A. Construct brush berm along contour lines by hand placing method. Do not use machine placement of brush berm.

B. Use woody brush and branches having diameter less than 2-inches with 6-inches overlap. Avoid incorporation of annual weeds and soil into brush berm.

C. Use minimum height of 18-inches measured from top of existing ground at upslope toe to top of berm. Top width shall be 24 inches minimum and side slopes shall be 2:1 or flatter.

D. Embed brush berm into soil a minimum of 4-inches and anchor using wire, nylon or polypropylene rope across berm with a minimum tension of 50 pounds. Tie rope securely to 18-inch x 3/8-inch diameter rebar stakes driven into ground on 4-foot centers on both sides of berm.

3.12 STREET AND SIDEWALK CLEANING

A. Keep areas clean of construction debris and mud carried by construction vehicles and equipment. If necessary, install stabilized construction exits at construction, staging, storage, and disposal areas, following Division 1.

B. In addition to stabilized construction access points, shovel or sweep pavements as required to keep areas clean. Do not water hose or sweep debris and mud off street into adjacent areas, except, hose sidewalks during off-peak hours, after sweeping.

3.13 WASTE COLLECTION AREAS

A. Prevent water runoff from passing through waste collection areas, and prevent water runoff from waste collection areas migrating outside collection areas.

3.14 EQUIPMENT MAINTENANCE AND REPAIR

A. Confine maintenance and repair of construction machinery and equipment to areas specifically designated for that purpose, so fuels, lubricants, solvents, and other potential pollutants are not washed directly into receiving streams or storm water conveyance systems. Provide these areas with adequate waste disposal receptacles for liquid and solid waste. Clean and inspect maintenance areas daily.

B. Where designated equipment maintenance areas are not feasible, take precautions during each individual repair or maintenance operation to prevent potential pollutants from washing into streams or conveyance systems. Provide temporary waste disposal receptacles.

3.15 VEHICLE/ EQUIPMENT WASHING AREAS

A. Install wash area (stabilized with coarse aggregate) adjacent to stabilized construction exit(s), as required to prevent mud and dirt run-off. Release wash water into drainage swales or inlets protected by erosion and sediment controls. Build wash areas following Division 1. Install gravel or rock base beneath wash areas.

B. Wash vehicles only at designated wash areas. Do not wash vehicles such as concrete delivery trucks or dump trucks and other construction equipment at locations where runoff flows directly into watercourses or storm water conveyance systems.

C. Locate wash areas to spread out and evaporate or infiltrate wash water directly into ground, or collect runoff in temporary holding or seepage basins.

3.16 WATER RUNOFF AND EROSION CONTROL

A. Control surface water, runoff, subsurface water, and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties.

B. Control fill, grading and ditching to direct water away from excavations, pits, tunnels, and other construction areas, and to direct drainage to proper runoff courses to prevent erosion, sedimentation or damage.

C. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

D. Dispose of drainage water to prevent flooding, erosion, or other damage to the site or adjoining areas. Follow environmental requirements.

E. Retain existing drainage patterns external to the site by constructing temporary earth berms, sedimentation basins, retaining areas, and temporary ground cover as required to control conditions.

F. Plan and execute construction and earth work to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
   1. Hold area of bare soil exposed at one time to a minimum.
   2. Provide temporary controls such as berms, dikes, and drains.

G. Construct fill and waste areas by selective placement to eliminate surface silts or clays which will erode.

H. Inspect earthwork periodically to detect start of erosion. Immediately apply corrective measures as required to control erosion.

I. Dispose of sediments offsite, not in or adjacent to streams or floodplains, nor allow sediments to flush into streams or drainage ways. Assume responsibility for offsite disposal location.

J. Unless otherwise indicated, compact embankments, excavations, and trenches by mechanically blading, tamping, and rolling soil in maximum of 8-inch layers. Provide compaction density at minimum 90 percent Standard Proctor ASTM D-698-78 density. Make at least one test per 500 cubic yards of embankment.

K. Do not maneuver vehicles on areas outside of dedicated rights-of-way and easements for construction. Immediately repair damage to erosion and sedimentation control systems caused by construction traffic.

L. Do not damage existing trees intended to remain.

3.17 REMOVAL OF CONTROLS

A. Remove erosion and sediment controls when the site is finally stabilized or as directed by Owner’s Representative.

B. Dispose of sediments and waste products following Division 1.

END OF SECTION

SECTION 01 71 36

PROTECTION OF EXISTING CONSTRUCTION

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide covering or otherwise implement protocols for the protection of all existing work indicated to remain as required to prevent damage resulting from ongoing or new Work.
   02 Provide covering protection at new doors and frames, casework and other installed new materials as required to prevent damage resulting from ongoing or subsequent new Work.

C. Related Work:
   01 Section 01 50 00 Temporary Facilities and Controls

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings:
   01 Submit Shop Drawings delineating types and locations of all proposed floor protection surfacing.

D. Installation Instructions:
   01 Submit complete installation instructions, including fastening and connection of adjacent protection surfaces, for all products and / or assemblies proposed to be furnished.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The following manufacturers are acceptable to provide flooring protection.
   01 Masonite (Basis of Design)
   02 Floor-Defender
   03 Ram Board

2.2 MATERIALS

A. Flooring Protection:
   01 Shall be minimum 1/8" Masonite sheeting in moderate load construction traffic areas and routes.
   02 Shall be minimum 1/4" Masonite sheeting in heavy load construction traffic areas and routes.
   01 Provide a semi-permanent means of attaching adjacent sheets which will stay secure throughout the usage period.

B. Wall Protection:
   02 Where walls are subject to damage caused by construction traffic and / or equipment, protect using minimum 1/8" Masonite sheeting to a minimum of 48” above finish floor.
   03 Where walls are subject to accumulation of dust and / or other construction debris, protect with minimum 6 mil polyurethane plastic sheeting or canvas drop cloths.
   04 Provide a semi-permanent means of attaching adjacent sheets which will stay secure throughout the usage period.

C. Doors and frames, casework, furniture and similar exposed existing materials shall be protected as required to prevent damage with minimum 6 mil polyurethane plastic sheeting.
   01 Lap all seams and secure continuously as required to prevent damage.

PART 3 – EXECUTION

3.1 DOCUMENTATION

A. Prior to the start of Work, Contractor shall provide video record of condition of existing work to remain.
   01 The documentation shall be thorough enough to be used at the conclusion of the Work to identify whether damage or blemishes were present prior to the start of Work.

B. Video documentation shall be used at the completion for work to confirm what if any damage is the result of Work.

3.2 FLOOR AND WALL PROTECTION

A. Contractor shall use all necessary means required to protect existing Work to remain.

B. Flooring Protection:
   01 Masonite flooring protection shall be sectioned together to create a 100% covering at construction paths used to transfer equipment and materials.
   02 All material being stored on floors within the building shall also have Masonite floor protection.
   03 Classroom floors shall be minimally protected with Ram Board and / or Floor Defender products.
   04 Flooring protection shall be taped together with duct tape, or similar, to prevent shifting and to keep liquid substances from leaking through.

C. Wall Protection:
   01 In high construction traffic areas, install Masonite from finish floor to 48” above (full sheet width).

02 Use a semi-permanent means of securing and maintaining Masonite in place.
03 Walls subject to construction debris and dust shall be covered at a minimum with plastic or cloth as required.

D. Doors and Frames, Casework, Furniture, and Similar:
01 Protection shall be at a minimum coverage with plastic or cloth; and more robust of existing Work is subject to damage.

3.3 REPAIR AND REPLACEMENT

A. All damage and blemishes discovered at the completion of Work that is not documented on the pre-Work video record shall be deemed to be caused by the Work.

B. Contractor shall promptly repair all damage and blemishes resulting from the construction activity.

C. Required Remediation:
01 Damaged flooring surfaces shall be replaced with the same materials.
02 Damaged painted surfaces shall be touched up at a minimum; and more broadly repainted if required to blend the repainted area with adjacent surfaces.
03 Damaged vinyl wall covering surfaces shall be replaced the full width of the vinyl sheet. Spot patching vinyl wall covering shall not be acceptable.
04 Damaged doors and frames, casework and similar work shall be repaired to meet original condition; and where that is not achievable, shall be replaced with new materials.

END OF SECTION

SECTION 01 74 16
SITE MAINTENANCE

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Restoration of site affected by the Work in public or private property, including pavement, esplanades, sidewalks, driveways, fences, lawns and landscaping.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum) Contracts. If Contract is Stipulated Price Contract, include payment for work under this section in total Stipulated Price.

1.3 DEFINITIONS

A. Phase: Locations identified on the plans and listed in Division 1.

B. Site Restoration: Replacement or reconstruction of Site Improvements located in rights-of-way, easements, public property, and private property affected or altered by the Work.

C. Site Improvement: Includes pavement, curbs and gutters, esplanades, sidewalks, driveways, fences, lawns, irrigation systems, landscaping, and other improvements in existence at the Project site before commencement of construction operations.

1.4 SCHEDULING

A. Schedule testing, service connections, abandonment, backfill and site restoration immediately following completion of work in an area.

B. Phased Construction:
1. Commencement of subsequent Phase will follow scheduling of site restoration of prior Phase. Limit work to a maximum of two Phases of the project.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Pavement, Sidewalks and Driveways: Materials specified in Division 32.

B. Seeding and Sodding: Sod specified in Division 32.

C. Trees, Shrubs and Plantings: Conform to requirements of Division 1.

PART 3 E X E C U T I O N

3.1 SITE PROJECTS

A. Contractor shall maintain a clean and orderly site throughout construction duration. Work includes but is not limited to: insuring grass is mowed and kept at a manageable height, trash is continuously picked up and construction materials are stored in an orderly fashion.

B. Contractor shall immediately repair and restore any damage done to adjoining properties such that final conditions are as equal to or better than prior to damage occurring.

3.2 WORK IN PUBLIC ROW

A. Contractor shall repair and replace any damaged items in the Public ROW to the satisfaction of the local governing authority.

3.3 CLEANING

A. Remove debris and trash to maintain a clean and orderly site in accordance with requirements of General Conditions and Division 1.

3.4 LANDSCAPING AND FENCES

A. Seeding and Sodding.
   1. Remove construction debris and level area with bank sand so that new grass surface matches level of existing grass and maintains pre-construction drainage patterns. Level and fill minor ruts or depressions caused by construction operations with bank sand, where grass is still viable.
   2. Restore previously existing turfed areas with sod and fertilize in accordance with Division 32. Sod to match existing turf.
   3. Restore unpaved areas not requiring sodding with hydromulch seeding conforming to Division 32.

B. Trees, Shrubbery and Plants.
   1. Remove and replant trees, shrubs, and plants in accordance with requirements of Division 1.

C. Fence Replacement.
   1. Replace removed or damaged fencing to equal or better condition than existed prior to construction, including concrete footings and mow strips. Provide new wood posts, top and bottom railing and panels. Metal fencing material, not damaged by the Work, may be reused.
   2. Remove and dispose of damaged or substandard material.

3.5 MAINTENANCE

A. Maintain shrubs, plantings, sodded areas and seeded areas. Replace shrubs, plantings and seeded or sodded areas that fail to become established.

B. Refer to Division 1 for maintenance requirements.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Disposal of waste material and salvageable material.

1.2 SUBMITTALS

A. Conform to requirements of Division 1.

B. Contractor shall obtain all required permits prior to disposal of excess material in areas designated as being in "100-year Flood Hazard Area."

C. Obtain and submit disposal permits for proposed disposal sites, if required by local ordinances.

D. Submit copy of written permission from property owner, with description of property, prior to disposal of excess material adjacent to Project. Submit written and signed release from property owner upon completion of disposal work.

E. Describe waste materials expected to be stored on-site and a description of controls to reduce Pollutants from these materials, including storage practices to minimize exposure of materials to storm water; and spill prevention and response measures in the Project's Storm Water Pollution Prevention Plan (SWPPP). Refer to Division 1.

PART 2 P R O D U C T S -Not Used

PART 3 E X E C U T I O N

3.1 SALVAGEABLE MATERIAL

A. Excavated Material: When indicated on Drawings, load, haul, and deposit excavated material at location or locations shown on Drawings outside limits of Project.

B. Base, Surface, and Bedding Material: Load shell, gravel, bituminous, or other base and surfacing material designated for salvage into Owner's designated trucks.

C. Pipe Culvert: Load culverts designated for salvage into Owner's designated trucks.

D. Other Salvageable Materials: Conform to requirements of individual Specification Sections.

E. Coordinate loading of salvageable material on Owner's trucks with Owner's Representative.

F. The Contractor shall dispose of all items the Owner refuses in conformance with the requirements of Division 1 at no additional cost to the Owner.

3.2 EXCESS MATERIAL

A. Remove and legally dispose of vegetation, rubble, broken concrete, debris, asphaltic concrete pavement, excess soil, and other materials not designated for salvage from job site.

B. Excess soil may be deposited on private property adjacent to Project when written permission is obtained from property owner. See Paragraph 1.02 D above.

C. Verify flood plain status of any proposed disposal site. Do not dispose of excavated materials in area designated as within 100-year Flood Hazard Area unless a permit has been obtained. Remove excess material placed in "100-year Flood Hazard Area" without a permit, at no additional cost to the Owner.

D. Remove waste materials from site daily, in order to maintain site in neat and orderly condition.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION

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. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion Procedures
   2. Final Completion Procedures
   3. Final Cleaning
   4. Repair of the Work
B. Related Requirements
   1. Section 01 29 00 – Payment Procedures
   2. Section 01 78 23 – Operation and Maintenance Data
   3. Section 01 78 39 – Project Record Documents
   4. Section 01 79 00 – Demonstration and Training

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents
B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion
C. Certified List of Incomplete Items: Final submittal at Final Completion

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction
B. Certificate of Insurance: For continuing coverage

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list).
B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, and similar final record information.
   3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00, Demonstration and Training.
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01 29 00, Payment Procedures. Architect will process final Certificate for Payment upon completion of all final completion procedures.
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Closeout Forms:
    a. Submit one copy each of the forms included herein and listed below, bound in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ inch by 11 inch paper. **Use only the enclosed forms. Forms retyped or altered in any way will not be accepted.** Additional copies of the forms are available from the Architect.
        1) Contractor's Affidavit of Payment of Debts and Claims – AIA G706 - 1994
        2) Contractor's Affidavit of Release of Liens – AIA G706A - 1994
        3) Consent of Surety to Final Payment – AIA G707 - 1994
        4) General Contractor Conditional Waiver and Release on Final Payment
        5) Subcontractor / Supplier Conditional Waiver and Release on Final Payment
        6) General Contractor Warranty
        7) Subcontractor Warranty
        8) General Contractor Hazardous Material Certificate
        9) Subcontractor/Supplier Asbestos Certificate
        10) Plumbing Subcontractor/Supplier Lead Certificate
        11) Mechanical Subcontractor/Supplier Refrigerants Certificate
        12) Electrical Subcontractor/Supplier PCB Certificate
        13) Certificate of TEA Compliance
    b. Insert additional forms required in other Sections.
    c. Provide heavy paper dividers with plastic-covered tabs for each type of form. Mark tab to identify the form.
    d. First sheet shall identify the Project, Owner, Architect, Architect's Consultants, and Contractor. Provide company name, address, telephone number and contact representative for each. Subsequent pages shall include the Table of Contents.
    e. Identify each binder on the front and spine with the typed or printed title "CLOSEOUT FORMS," Project name, and name of Contractor.
    f. Closeout Forms Electronic File: Scan Closeout Forms and assemble complete package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.
    1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
    2. Reinspection Fees: Should reinspection(s) in addition to the initial reinspection be necessary due to Contractor's failure to have completed all Work as claimed, Owner will execute a change order reducing the Contract Sum by an amount equal to the cost of the extra services of the Architect and the Architect's consultants incurred as a result of the additional reinspection(s).

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
    1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
    2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
    3. Submit list of incomplete items in the following formats:
        a. MS Excel electronic file
        b. PDF electronic file
        c. Three paper copies

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8½ inch by 11 inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

3 EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Complete cleaning procedures and requirements required in other Sections.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00, Temporary Facilities and Controls.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.3 GENERAL

A. Upon issuance of the (final) Certificate of Substantial Completion, and per the Owner-Contractor Agreement, the Contractor will be allowed a period of sixty (60) days within which to complete all Contract Close-Out requirements, unless extended by mutual agreement or provision of the Contract.

B. In addition to all work and requirements described for Substantial Completion, in order to achieve Contract Close-Out, the Contractor shall submit the following Close-Out documents in 3-ring binders in the following format:

1. Tab 1: Copy of executed Certificate of Substantial Completion and copy of all final punch lists showing final approval / acceptance of each item by sub-contractor, Contractor and Architect / Architect's Consultant.
2. Tab 2: Copy of HB 1458 Waiver Release Progress or Final Payment.
3. Tab 3: Copy of all building permits.
4. Tab 4: Copy of all Certificates of Occupancy and final approvals of authorities having jurisdiction.
5. Tab 5:
    a. Final list of sub-contractors - alphabetical listing. List shall contain company name, address, phone number, contact person, relative specification section number, and description of work provided.
    b. Final list of sub-contractors - numerical specification section number listing. List shall contain company name, address, phone number, contact person, and description of work provided.
6. Tab 6: Copy of AIA G707-1994 Consent of Surety to Final Payment. Must be notarized. (Note: Architect shall provide standardized form to be used.)
7. Tab 7: Copy of AIA G706-1994 Contractor's Affidavit of Payment of Debts and Claims. Must be notarized. (Note: Architect shall provide standardized form to be used.)
8. Tab 8: AIA G706A-1994 Contractor's Affidavit of Release of Liens. Must be notarized. (Note: Architect shall provide standardized form to be used.)
9. Tab 9: Contractor's written one (1) year warranty / guarantee. Must be notarized. (Note: Architect shall provide standardized form to be used.)
10. Tab 10: Contractor's Affidavit of Hazardous Material. Must be notarized. (Note: Architect shall provide standardized form to be used.)
11. Tab 11: Copy of TAB Testing & Balancing form.
12. Tab 12: Copy of TEA Certificate of Compliance.
13. Tab 13:
    a. Finish Floor Elevation Certificate from a registered Land Surveyor; if required by the local jurisdiction having authority.
    b. As-built survey of detention pond from a registered Land Surveyor to certify the detention pond was constructed in accordance with the permitted design; if required by the local jurisdiction having authority.
14. Tab 14: Record Drawings. Refer to Section 3.4 below. Record Drawings shall be submitted separately from Close-Out binders / manuals.
15. Tab 15: Owner's set of record, final submittals. Refer to Section 3.5 below. Record Submittals shall be submitted separately from Close-Out binders / manuals.
16. Tab 16: Subcontractors' / Material / Equipment Suppliers Affidavit of Release of Liens. Must be notarized. (Note: Architect shall provide standardized form to be used.)
17. Tab 17: Subcontractors' written 12-month warranty / guarantee. Must be notarized. (Note: Architect shall provide standardized form to be used.)
18. Tab 18: Manufacturer's written warranties to the Owner for each product / assembly / system warranty required in individual specification sections. Manufacturer's warranties shall be submitted separately from Close-Out binders / manuals. Organize and identify each manufacturer's written warranty (top right hand corner) by subcontractor's name - in alphabetical order; and identify with the corresponding specification section number – scope of work.
19. Tab 19: Subcontractors' and suppliers Affidavits stating that no asbestos or hazardous material products have been installed in this project. Must be notarized. (Note: Architect shall provide standardized form to be used.)
20. Tab 20: If asbestos abatement was performed, provide a copy of all applicable governmental forms, final test reports and certifications.
21. Tab 21: Copy of Plumbing Lead Certificate.
22. Tab 22: Copy of Mechanical Refrigerant's Certificate.
23. Tab 23: Copy of Electrical PCB Certificate.
24. Tab 24: Copy of Certificate of Inspections.

25. Tab 25: Serial Numbers, Special Tools, Keys, Locker Combinations.
26. Tab 26: Extra stock verifications of product delivery to Owner
27. Tab 27: Owner demonstration and / or training verification. Provide sign-in sheet for all demonstrations and training sessions conducted for the Owner.
28. Tab 28: Video Documentation Sign In Sheets.

C. Final / 100% release of retainage will not be authorized by the Architect until the Contractor completes all of the requirements for Contract Close-Out; and until all expenses incurred and to be paid by the Contractor have been paid in full.

D. D. It is the Contractor's sole responsibility prior to submission to verify that Close-Out documents proposed to be furnished for review and acceptance are 100% complete and accurate.
   1. If during review the Architect or Engineer determines the Close-Out documents are incomplete and / or inaccurate, the review shall cease and the Contractor shall be so notified to retrieve the Close-Out Documents, make corrections and resubmit.
   2. It is not the A/E Consultants' responsibility to return a list of missing and / or incorrect items.

E. It is desirable and beneficial to submit all Close-Out documents as a single submission; Close-Out documents may be submitted separately in four (4) deliverables as follows:
   1. Close-Out Manual
   2. Operations and Maintenance Manuals (required prior to Substantial Completion)
   3. Record Drawings
   4. Owner's Record Copy of Submittals
   5. Manufacturer's Written Warranties

3.4 CLOSE-OUT MANUAL(S) FORMAT

A. All Close-Out documents shall be submitted in three ring binders with detailed table of contents and index tabs corresponding to the table of contents.
   1. Documents shall be separated by tabs as indicated in Paragraph 3.1 above.
   2. The Close-Out documents must be neatly organized and easily useable, as determined by the Architect and Owner.
   3. Each binder shall include an insert cover with the following information
      a. Project name
      b. Binder Title: Close-Out Manual - "description"
      c. Architect's name
      d. Architect's project number
      e. Owner's CSP number
      f. Contractor's name, address and phone number
   4. Each binder shall include an insert in the binder spine with the following information
      a. Project name
      b. Binder Title: Close-Out Manual - "description"
   5. Inside cover page containing the following:
      a. Project name
      b. Contractor's address and contact information
      c. Contractor's project manager and superintendent name and contact information.
      d. Architect's project manager name and contact information.
      e. Each consultant's project manager name and contact information.
   6. Table of Contents and corresponding section tabs shall be in the same order as described in section 3.1-B above.
   7. Provide one (1) bound copy of the Close-Out documents binder for review by the Architect. No PDF copies to be provided until final acceptance of all binders.

8. Resubmit as necessary to obtain final acceptance of Close-Out documents binder.
9. Once all corrections have been made and the Close-Out documents binder is found to be acceptable, provide final copies to the Architect for transfer to the Owner.
10. Number of binders required: two (2).
11. Number of flash drives with electronic format required: two (2).

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)* 2022 Bond New Williams Elementary School Replacement **TO OWNER:** *(Name and address)* Pasadena ISD	**ARCHITECT'S PROJECT NUMBER:** 202301 PISD Project No. 24:-011LP **CONTRACT FOR:** General Construction **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

1

AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)* 2022 Bond New Williams Elementary School Replacement	**ARCHITECT'S PROJECT NUMBER:** 202301 PISD Project No. 24:-011LP	OWNER: ☐ ARCHITECT: ☐
	CONTRACT FOR: General Construction	CONTRACTOR: ☐
TO OWNER: *(Name and address)* Pasadena ISD	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

_____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* 2022 Bond New Williams Elementary School Replacement	**ARCHITECT'S PROJECT NUMBER:** 202301 PISD Project No. 24:-011LP **CONTRACT FOR:** General Construction	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐
TO OWNER: *(Name and address)* Pasadena ISD	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

1

GENERAL CONTRACTOR
CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

PROJECT: 2022 BOND – New Williams Elementary School Replacement
OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

On receipt by the signer of this document of a check from Pasadena Independent School District in the sum of $_____, payable to _____, *General Contractor* 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 Pasadena Independent School District located at _____ to the following extent: All work related to construction of 2022 BOND – Roof Replacement Pkg. 1.

This release covers the final payment to the signer for all labor, services, equipment, or materials furnished to the property or to Pasadena Independent School District.

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, material, men, 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 *By (signature)*

_____ _____

Company Name *Title*

STATE OF TEXAS §
§
COUNTY OF HARRIS §

This instrument was acknowledged before me on this _____ day of _____, 20____, by

_____, _____ of
Name *Job Title*

_____.
Company Name

Notary Public: _____

My Commission Expires: _____

SUBCONTRACTOR / SUPPLIER CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

PROJECT: 2022 BOND New Williams Elementary School Replacement

OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

On receipt by the signer of this document of a check from _____
General Contractor

in the sum of $_____, payable to _____
Subcontractor / Supplier

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 Pasadena Independent School

District located at _____
to the following extent: All work related to construction of 2022 BOND – Roof Replacement Pkg. 1.

This release covers the final payment to the signer for all labor, services, equipment, or materials furnished to the property or to _____.
Person or Entity 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 *By (signature)*

_____ _____
Company Name *Title*

STATE OF TEXAS §
§
COUNTY OF HARRIS §

This instrument was acknowledged before me on this _____ day of _____, 20____, by

_____, _____ of
Name *Job Title*

_____.
Company Name

Notary Public: _____

My Commission Expires: _____

GENERAL CONTRACTOR WARRANTY

STATE OF TEXAS

COUNTY OF _____

PROJECT: 2022 BOND – New Williams ES Replacement
OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the contractor who constructed the project referenced above, and that, he is duly authorized to make this General Contractor Warranty.

2. The undersigned Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract are of good quality and new except where otherwise required or permitted by the Contract Documents, that the Work is free from defects not inherent in the quality required or permitted, and that the Work conforms with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy from damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

3. In the event of failure of materials, products, or workmanship, during the specified warranty periods, the Contractor shall take appropriate measures to assure correction or replacement of the defective items, whether notified by the Owner or Architect.

4. The Contractor warrants the entire project for a period of **12** months from the Date of Substantial Completion and specific sections of work for such additional periods as enumerated in the Contract Documents, except as follows:

_____

_____

ATTEST (If Corporation)

_____
Name of Contractor

_____ _____ _____
Secretary By Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

SUBCONTRACTOR WARRANTY

STATE OF TEXAS

COUNTY OF _____

PROJECT:2022 BOND – New Williams ES Replacement
OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the subcontractor who supplied, installed, and/or erected the work described below, and that, he is duly authorized to make this Subcontractor Warranty:

   Work Performed: _____

   Specification Section(s): _____

2. The undersigned Subcontractor warrants to the Owner and Architect that materials and equipment furnished under the Contract are of good quality and new except where otherwise required or permitted by the Contract Documents, that the Work is free from defects not inherent in the quality required or permitted, and that the Work conforms to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Subcontractor's warranty excludes remedy from damage or defect caused by abuse, modifications not executed by the Subcontractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

3. In the event of failure of materials, products, or workmanship, during the specified warranty periods, the Contractor shall take appropriate measures to assure correction or replacement of the defective items, whether notified by the Contractor, Owner or Architect.

4. The Subcontractor warrants the work performed for a period of _____ months from the Date of Substantial Completion, except as follows:

   _____

   _____

ATTEST (If Corporation)

_____
Name of Subcontractor / Supplier

_____ _____ _____
Secretary By Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

GENERAL CONTRACTOR HAZARDOUS MATERIAL CERTIFICATE

STATE OF TEXAS

COUNTY OF _____

PROJECT: 2022 BOND – New Williams ES
Replacement OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the contractor who constructed the project referenced above, and that, he is duly authorized to make this Certification.

2. That to the best of his information, knowledge, and belief none of the below listed hazardous materials have been incorporated into the project:
   - Asbestos or asbestos containing materials
   - Lead in any portion of drinking water system (conformance with the Safe Drinking Water Acts Amendment of 1986 is required)
   - Refrigerant R-11 (Trichlorofluoromethane)
   - Refrigerant R-12 (Dichlorodhfluoromethane)
   - Refrigerant R-113 (Trichlorotrifluoromethane)
   - Refrigerant R-114 (Dichlortetrafluoromethane)
   - Refrigerant R-500 (combination of R-12 and R-152a)
   - Refrigerant R-502 (combination of R-22 and R-115)
   - Transformer Cooling Agent P.C.B. (Polychloride Biphenyls)

ATTEST (If Corporation)

_____
Name of Contractor

_____ _____ _____
Secretary By Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

SUBCONTRACTOR / SUPPLIER ASBESTOS CERTIFICATE

STATE OF TEXAS

COUNTY OF _____

PROJECT: 2022 BOND – – New Williams ES Replacement OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the subcontractor/supplier who constructed or provided the sections of work described below, and that, he is duly authorized to make this Certification.

   Work Performed: _____

   Specification Section(s): _____

2. That to the best of his information, knowledge, and belief **no asbestos or asbestos containing materials** have been incorporated into the project.

ATTEST (If Corporation)

_____
Name of Subcontractor / Supplier

_____ _____ _____
Secretary By Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

PLUMBING SUBCONTRACTOR / SUPPLIER LEAD CERTIFICATE

STATE OF TEXAS

COUNTY OF _____

PROJECT: 2022 BOND – New Williams ES Replacement OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the subcontractor/supplier who constructed or provided the sections of work described below, and that, he is duly authorized to make this Certification.

   Work Performed: _____

   Specification Section(s): _____

2. That to the best of his information, knowledge, and belief **no lead** has been incorporated in any portion of the drinking water system and the system is in conformance with the Safe Drinking Water Acts Amendment of 1986.

ATTEST (If Corporation)

_____
Name of Subcontractor / Supplier

_____	_____	_____
Secretary	By	Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

MECHANICAL SUBCONTRACTOR / SUPPLIER REFRIGERANT CERTIFICATE

STATE OF TEXAS

COUNTY OF _____

PROJECT: 2022 BOND – New Williams ES Replacement OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the subcontractor/supplier who constructed or provided the sections of work described below, and that, he is duly authorized to make this Certification.

   Work Performed: _____

   Specification Section(s): _____

2. That to the best of his information, knowledge, and belief none of the refrigerants listed below have been incorporated into the project:
   - Refrigerant R-11 (Trichlorofluoromethane)
   - Refrigerant R-12 (Dichlorodhfluoromethane)
   - Refrigerant R-113 (Trichlorotrifluoromethane)
   - Refrigerant R-114 (Dichlortetrafluoromethane)
   - Refrigerant R-500 (combination of R-12 and R-152a)
   - Refrigerant R-502 (combination of R-22 and R-115)

ATTEST (If Corporation)

_____
Name of Subcontractor / Supplier

_____ _____ _____
Secretary By Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

ELECTRICAL SUBCONTRACTOR / SUPPLIER PCB CERTIFICATE

STATE OF TEXAS

COUNTY OF _____

PROJECT: 2022 BOND – New Williams ES Replacement OWNER: Pasadena Independent School District
ARCHITECT: Texas Arcadis Inc.

KNOW ALL MEN BY THESE PRESENTS:

_____, being first duly sworn, disposes and says:

1. That he is the _____ of _____, the subcontractor/supplier who constructed or provided the sections of work described below, and that, he is duly authorized to make this Certification.

   Work Performed: _____

   Specification Section(s): _____

2. That to the best of his information, knowledge, and belief **no Transformer Cooling Agent P.C.B.s (Polychloride Biphenyls)** have been incorporated into the project:

ATTEST (If Corporation)

_____
Name of Subcontractor / Supplier

_____	_____	_____
Secretary	By	Date

Subscribed and sworn to before me on this _____ day of _____, 20____

Notary Public: _____

My Commission Expires: _____

CERTIFICATION OF PROJECT COMPLIANCE

Completion of this form is required under the provisions of §61.1036(c)(3)(F) TAC for all public school district construction projects. Instructions for completion of this form can be found on page 2.

1. PROJECT INFORMATION

DISTRICT:

Facility:

ARCHITECT/ENGINEER:

Address:

CONTRACTOR/CM:

City:

CONTRACT DATE:

DATE DISTRICT AUTHORIZED PROJECT:

BRIEF DESCRIPTION OF PROJECT:

This document is provided for reference only. The General Contractor is to execute Section 5 of the original, which is in the custody of the School District, upon Substantial Completion of the Project.

2. CERTIFICATION OF DESIGN AND CONSTRUCTION

The intent of this document is to assure that the school district has provided to the architect/engineer the required information and the architect/engineer has reviewed the School Facilities Standards as required by the State of Texas, and used his/her reasonable professional judgment and care in the architectural/engineering design and that the contractor has constructed the project in a quality manner in general conformance with the design requirements and that the school district certifies to project completion.

3. The District certifies that the educational program and the educational specifications of this facility along with the identified building code to be used have been provided to the architect/engineer.

DISTRICT: **BY:** **DATE:**

4. The Architect/Engineer certifies the above information was received from the school district, and that the building(s) were designed in accordance with the applicable building codes. Further, the facility has been designed to meet or exceed the design criteria relating to space (minimum square footage), educational adequacy, and construction quality as contained in the School Facilities Standards as adopted by the Commissioner of Education, June 9, 2003, 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).

END OF SECTION 01 77 00

DISTRICT: **BY:** **DATE:**

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION

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. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory
   2. Operation manuals for systems, subsystems, and equipment
   3. Product maintenance manuals
   4. Systems and equipment maintenance manuals
B. Related Requirements
   1. Section 01 33 00 – Submittal Procedures
   2. Section 01 77 00 – Closeout Procedures
   3. Section 01 78 39 – Project Record Documents
   4. Section 01 79 00 – Demonstration and Training

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.
   2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

2 PRODUCTS

2.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page
   2. Table of contents
   3. Manual contents

B. Title Page: Include the following information:
   1. Subject matter included in manual
   2. Name and address of Project
   3. Name and address of Owner
   4. Date of submittal
   5. Name and contact information for Contractor
   6. Name and contact information for Architect
   7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals
   8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Enable bookmarking of individual documents based 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 file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8½ inch by 11 inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8½ inch by 11 white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards
   4. Operating procedures
   5. Operating logs
   6. Wiring diagrams
   7. Control diagrams
   8. Piped system diagrams
   9. Precautions against improper use
   10. License requirements including inspection and renewal dates

B. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name
   3. Equipment identification with serial number of each component
   4. Equipment function
   5. Operating characteristics
   6. Limiting conditions
   7. Performance curves
   8. Engineering data and tests
   9. Complete nomenclature and number of replacement parts

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures
   2. Equipment or system break-in procedures
   3. Routine and normal operating instructions
   4. Regulation and control procedures
   5. Instructions on stopping
   6. Normal shutdown instructions
   7. Seasonal and weekend operating instructions
   8. Required sequences for electric or electronic systems
   9. Special operating instructions and procedures

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Product Information: Include the following, as applicable:
    1. Product name and model number
    2. Manufacturer's name
    3. Color, pattern, and texture
    4. Material and chemical composition
    5. Reordering information for specially manufactured products
D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    1. Inspection procedures
    2. Types of cleaning agents to be used and methods of cleaning
    3. List of cleaning agents and methods of cleaning detrimental to product
    4. Schedule for routine cleaning and maintenance
    5. Repair instructions
E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
    1. Include procedures to follow and required notifications for warranty claims.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
    1. Standard maintenance instructions and bulletins
    2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly
    3. Identification and nomenclature of parts and components
    4. List of items recommended to be stocked as spare parts
D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
    1. Test and inspection instructions
    2. Troubleshooting guide
    3. Precautions against improper maintenance
    4. Disassembly; component removal, repair, and replacement; and reassembly instructions

5. Aligning, adjusting, and checking instructions
6. Demonstration and training video recording, if available

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

3 EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Section 01 78 39, Project Record Documents.

E. Comply with Section 01 77 00, Closeout Procedures, for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION

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. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including Record Drawings and miscellaneous record submittals
B. Related Requirements:
   1. Section 01 77 00 – Closeout Procedures

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit one set of plots.
         2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and one set of prints.
         2) Print each drawing, whether or not changes and additional information were recorded.
B. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record- keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

2 PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding archive photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings

b. Revisions to details shown on Drawings
c. Depths of foundations below first floor
d. Locations and depths of underground utilities
e. Revisions to routing of piping and conduits
f. Revisions to electrical circuitry
g. Actual equipment locations
h. Duct size and routing
i. Locations of concealed internal utilities
j. Changes made by Change Order or Construction Change Directive
k. Changes made following Architect's written orders
l. Details not on the original Contract Drawings
m. Field records for variable and concealed conditions
n. Record information on the Work that is shown only schematically

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Identification: As follows:
a. Project name
b. Date
c. Designation "PROJECT RECORD DRAWINGS"
d. Name of Architect
e. Name of Contractor

2.2 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

3 EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00

DEMONSTRATION AND TRAINING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION

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. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment
   2. Training in operation and maintenance of systems, subsystems, and equipment
   3. Demonstration and training video recordings
B. Related Requirements
   1. Section 01 33 00, Submittal Procedures
   2. Section 01 77 00, Closeout Procedures
   3. Section 01 78 23, Operation and Maintenance Data
   4. Section 01 78 39, Project Record Documents

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
B. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project
      b. Name of Architect
      c. Name of Contractor
      d. Date of video recording
   2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
   3. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

2 PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
B. Training Modules: Develop a teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
    1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
        a. System, subsystem, and equipment descriptions
        b. Performance and design criteria if Contractor is delegated design responsibility.
        c. Operating standards
        d. Regulatory requirements
        e. Equipment function
        f. Operating characteristics
        g. Limiting conditions
        h. Performance curves
    2. Documentation: Review the following items in detail:
        a. Emergency manuals
        b. Operations manuals
        c. Maintenance manuals
        d. Project record documents
        e. Identification systems
        f. Warranties and bonds
        g. Maintenance service agreements and similar continuing commitments
    3. Emergencies: Include the following, as applicable:
        a. Instructions on meaning of warnings, trouble indications, and error messages
        b. Instructions on stopping
        c. Shutdown instructions for each type of emergency
        d. Operating instructions for conditions outside of normal operating limits
        e. Sequences for electric or electronic systems
        f. Special operating instructions and procedures
    4. Operations: Include the following, as applicable:
        a. Startup procedures
        b. Equipment or system break-in procedures

c. Routine and normal operating instructions
d. Regulation and control procedures
e. Control sequences
f. Safety procedures
g. Instructions on stopping
h. Normal shutdown instructions
i. Operating procedures for emergencies
j. Operating procedures for system, subsystem, or equipment failure
k. Seasonal and weekend operating instructions
l. Required sequences for electric or electronic systems
m. Special operating instructions and procedures

5. Adjustments: Include the following:
   a. Alignments
   b. Checking adjustments
   c. Noise and vibration adjustments
   d. Economy and efficiency adjustments
6. Troubleshooting: Include the following:
   a. Diagnostic instructions
   b. Test and inspection procedures
7. Maintenance: Include the following:
   a. Inspection procedures
   b. Types of cleaning agents to be used and methods of cleaning
   c. List of cleaning agents and methods of cleaning detrimental to product
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance
   f. Procedures for routine maintenance
   g. Instruction on use of special tools
8. Repairs: Include the following:
   a. Diagnosis instructions
   b. Repair instructions
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions
   d. Instructions for identifying parts and components
   e. Review of spare parts needed for operation and maintenance

3 EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23, Operation and Maintenance Data.
B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
   1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
   1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
   2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
   3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
   4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
      a. Name of Contractor/Installer
      b. Business address
      c. Business phone number
      d. Point of contact
      e. E-mail address

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
   1. Film training session(s) in segments not to exceed 15 minutes.
      a. Produce segments to present a single significant piece of equipment per segment.
      b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
      c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
   1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Reproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 02 32 00

GEOTECHNICAL INVESTIGATION

CONDITIONS OF THE CONTRACT, DIVISION 0 and DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Geotechnical Investigation Report is not a part of the Contract Documents but is included for Contractor's reference and use in determining specific scopes of work required for the complete project.

B. The Geotechnical Investigation Report specific to this project follows this Section and is identified as:

01	Entitled:	Williams Elementary School Replacement Geotechnical Engineering Report
02	Prepared by:	Terracon Consultants, Inc.
03	Project No.:	91235141
04	Dated:	March 22, 2024
05	Total Pages:	63

1.2 APPLICABILITY

A. The Geotechnical Investigation Report is provided for proposer's general information only. Architect and Owner shall not be held responsible for accuracy of data contained in the Geotechnical Report.

01 Questions or request for additional information regarding the Geotechnical Investigation Report shall be made in writing directly to the Geotechnical Lab and copied to the Architect.

B. Prior to submission of proposals, Proposers shall visit and acquaint themselves with existing conditions and make any additional investigations they deem necessary to properly propose work and satisfy themselves as to existing subsurface conditions.

01 Such investigations shall be performed only under time schedules and arrangements approved in advance by the Owner.

02 Upon making on-site observations, the Proposer shall inform the Architect of any discrepancies with the Geotechnical Investigation Report and / or any concerns the Proposer has relative to existing site conditions.

C. No additional cost will be made available to the successful proposer for work arising from his failure to examine site or subsoil conditions prior to proposing.

D. The Geotechnical Investigation Report is not a part of the Contract Documents, but is included for Contractor's reference and use in determining specific scopes of work required for the completed project.

E. A copy of the Geotechnical Investigation Report (63 pages) is attached to this Section.

SEE ATTACHED REPORT

END OF SECTION

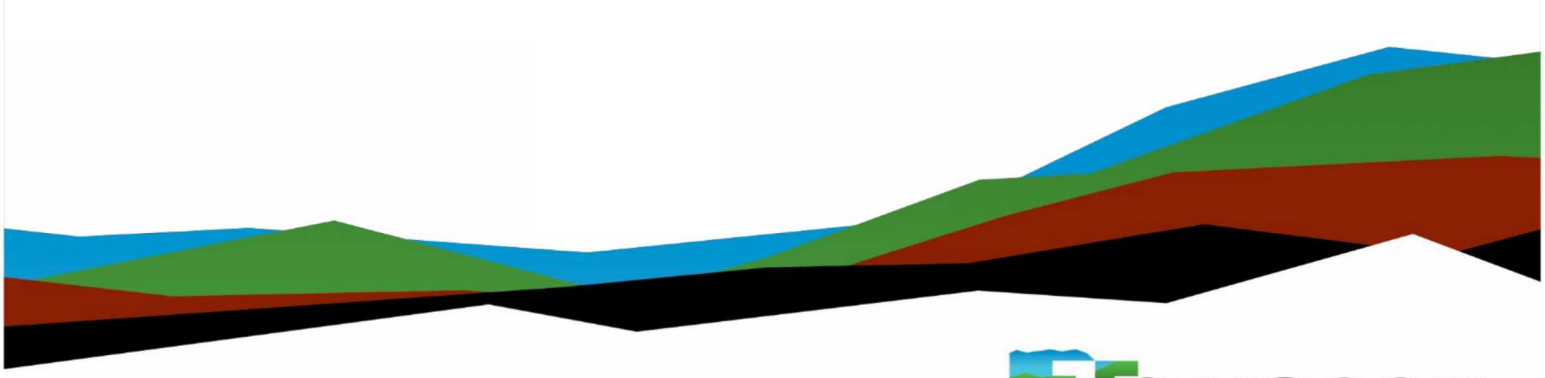
Williams Elementary School Replacement

Geotechnical Engineering Report

March 22, 2024 | Terracon Project No. 91235141

Prepared for:

Pasadena Independent School District
1814 East Sam Houston Parkway South
Pasadena, Texas 77503



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March 22, 2024

Pasadena Independent School District
1814 East Sam Houston Parkway South
Pasadena, Texas 77503

Attn: Mr. Brian Hanson – Project Manager – Facilities and Construction
E: BHanson@pasadenaisd.org

Re: Geotechnical Engineering Report
Williams Elementary School Replacement
1452 Queens Street
Houston, Texas
Terracon Project No. 91235141

Dear Mr. Hanson:

We have completed the scope of geotechnical engineering services for the above referenced project in general accordance with Terracon Proposal No. P91235141 dated October 27, 2023. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Terracon Consultants, Inc.
(Texas Firm Registration No.: F-3272)

Daniel B. Mabirizi, E.I.T.
Project Manager

Joshua C. Miles, P.E.
Department Manager

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Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed new elementary school to be located at the existing Pasadena ISD Softball fields at 1452 Queens Street in Houston, Texas. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Earthwork / subgrade preparation
- Foundation design and construction
- Floor slab design and construction
- Detention pond construction considerations
- Pavement design guidelines

The geotechnical engineering Scope of Services for this project included the advancement of twelve soil borings, six cone penetration tests (CPT), laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring and CPT locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs in the **Exploration Results** section.

Project Description

Item	Description
Information Provided	Project description and the site plan were provided by Pasadena ISD on October 17, 2023.
Proposed Structures	This project involves replacement of Williams Elementary School Campus. The new improvements will include the following: ■ A new two-story building with a footprint of approximately 79,000 square feet. ■ Associated parking lot and drive lanes. ■ Detention pond expansion with a footprint of approximately 2.5 acres and maximum depth of 15 feet with sideslopes of 4 horizontal to 1 vertical (4H:1V) or flatter. ■ Playground areas

Item	Description
Finished Floor Elevation	Anticipated to be within 2 feet above existing grade.
Building Construction	Anticipated to be steel-frame construction
Maximum Loads	▪ Columns: 100 to 300 kips ▪ Walls: 6 to 8 kips per linear foot (klf) ▪ Slabs: 150 pounds per square foot (psf)
Pavements	Information regarding anticipated traffic and preferred pavement surfacing has not been provided. We anticipate that traffic will consist of passenger vehicles, school bus traffic, and fire lanes. For concrete pavement, traffic categories and daily traffic will be assumed to consist of: ▪ Category A: Car parking areas and access lanes, 1 truck per day ▪ Category C: Buses ▪ Category E: Garbage or fire truck lanes Unless information is provided prior to the report, we assume that the traffic classification for asphalt pavements will consist of: ▪ Class I: Parking stalls for autos and pickup trucks ▪ Class II: Traffic consisting of buses, delivery trucks, trash pickup The pavement design period is 20 years. We anticipate a fire lane will need to be designed to 80,000-pound wheel load, up to 2 times annually.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Parcel Information	The project is located at 1452 Queens Street in Houston, Texas. Project GPS: 29.67730, -95.22682 (approximate) See **Site Location**

Item	Description
Existing Improvements	The site is occupied by three baseball/softball fields along with two buildings near the central hub of the fields. Features associated with the softball complex include bleachers, dugouts, and light poles.
Current Ground Cover	Asphalt pavement, grass, and a few trees
Existing Topography	Relatively level

Geotechnical Characterization

Geology

Based on the geologic maps published by the Bureau of Economic Geology, the site for the proposed construction is located on the Beaumont formation, a deltaic nonmarine Pleistocene deposit. The Beaumont formation is heterogeneous containing thick interbedded layers of clay, fine sand, and silt.

The clay fraction is primarily composed of montmorillonite, illite, kaolinite, and finely ground quartz. The clay present in the formation has been preconsolidated by a process of desiccation. Numerous wetting and drying cycles have produced a network of small randomly oriented, closely-spaced joints within some depth zones. These small joints frequently have a shiny appearance and the clays are called slickensided in these cases. The joint pattern may have an influence on the construction and engineering behavior of the soil.

The coastal plain in this region has a complex tectonic geology, several major features of which are: Gulf Coastal geosyncline, salt domes, and major sea level fluctuations during the glacial stages, subsidence and geologic faulting activities. Most of these geologic faulting activities have ceased for millions of years, but some are still active. A detailed geologic fault investigation and study of the site geology are beyond the scope of this report.

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in

the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Pavement	Approximately 1 to 2 inches of asphaltic concrete overlying about 6 inches of cursed stone
2	Fill – Fat Clay	dark gray, tan, and light gray, with ferrous and calcareous nodules, and slickensides
3	Fat Clay	dark gray, gray, tan, and light gray, medium stiff to very stiff, with ferrous and calcareous nodules, and slickensides

Groundwater Conditions

Borings B-01 through B-12 were advanced using dry drilling techniques to their termination depths (approximately 5 to 25 feet). Groundwater was not observed in these borings during or upon completion of drilling. The absence of groundwater in the borings does not necessarily mean the borings terminated above groundwater. A relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long-term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

The near surface high plasticity clays could become unstable with typical earthwork and construction traffic, especially after precipitation events. The effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The expansive soils present on this site are a key geotechnical concern. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and (at least minor) cracking in the structure should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction, such as complete replacement of expansive soils or a structural slab; these options are not discussed in this report but could be developed if requested.

The proposed building may be supported on a foundation system consisting of either drilled-and-underreamed footings or shallow footings or drilled straight shafts. The **Drilled-and-Underreamed Footings** section addresses support of the building on deeper footings. The **Shallow Foundations** section addresses support of the building directly bearing on properly placed and compacted select fill. The **Deep Foundations** section addresses support of the building on deep foundations. The **Floor Slabs** section addresses slab-on-grade support of the building on approved select fill.

Our opinion of pavement section thickness design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein using methodology contained in ACI 330 "Guide to Design and Construction of Concrete Parking Lots" and NAPA IS-109 "Design of Hot Mix Asphalt Pavements" and adjusted with consideration to local practice. The **Pavements** section includes our recommended minimum pavement component thickness.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Earthwork

Earthwork is anticipated to include demolition, stripping, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Demolition

The site is currently occupied by buildings, baseball/softball fields, bleachers, dugouts, and light poles. Special care should be exercised to demolish and/or remove any existing foundations, pavements, utilities, and buried structures to help reduce the disturbance of the subgrade and potential detrimental effects on construction of the proposed development at this site.

Geophysical methods can be employed to help locate and identify foundations, other buried structures, and utilities. This information can be compared to the proposed plans for the site to help avoid conflicts, as well as identify buried structures/utilities not previously known to exist on site. Terracon should be contacted for additional services if geophysical methods are desired to be utilized to aid in the demolition and re-development of the site.

We are unaware of current foundation support of the existing structures, and shallow footings, drilled-and-underreamed footings, and/or straight shaft foundations could be present. Shallow footings and grade beams should be removed, and the excavation backfilled with properly placed and compacted select fill. If drilled footings or straight shafts are observed, we recommend that the shaft should be broken off at an elevation about 24 to 36 inches below the bottom of the proposed grade beam depth. The remainder of the drilled footing or straight shaft should be left in place. Remnants of the foundation elements to remain should be surveyed. The existing foundations should be superimposed on the proposed development plans to evaluate the potential for obstructions with the new construction. If drilled footings are planned to be excavated and completely removed, Terracon should be contacted for additional recommendations. Complete removal of drilled footings will require significant earthwork activities to backfill the resulting excavations in such a manner as to make the site suitable for new construction.

All utilities and associated bedding material that are planned to be abandoned should be completely removed from within the proposed building areas. As an alternate to complete removal, the existing utilities may be abandoned in-place if they do not interfere with the planned development. If the utilities are abandoned in-place, they should be properly pressure grouted to completely fill the utility.

The excavations resulting from the utilities or other buried structures should be backfilled in accordance with the recommendations provided in in **Fill Material Types** and **Fill Compaction Requirements** subsections. If situations are encountered where compaction of fill would not be efficient because of the size or location of an excavation, the use of cement stabilized sand or flowable fill may be considered as a suitable alternative to select fill. The compressive strength of the cement stabilized sand or flowable fill utilized should be between 50 and 100 pounds per square inch (psi).

Existing Fill

Borings B-01, 02, 03, 06, 07, 11 and 12 encountered previously placed fill to depths ranging from about 1 to 2 feet. We have no records to indicate the degree of control, and consequently, the fill is considered unreliable for support of structural loads. Support of pavements on or above existing fill soils is discussed in this report. However, even with the recommended construction procedures, inherent risk exists for the owner that compressible fill or unsuitable material, within or buried by the fill will, not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by following the recommendations contained in this report.

Subgrade Preparation

The existing pavement (including crushed stone), vegetation, topsoil, root mats, and other debris or unsuitable materials should be removed from the construction areas. Proper site drainage should be maintained during construction so that ponding of surface runoff does not occur and cause construction delays and/or inhibit site access.

Prior to placing any fill, the exposed subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be improved by either scarifying and compaction or by removal and replacement with approved fill material outlined in **Fill Material Types** subsection or modified by chemically treating/applying/mixing with lime. Excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

We recommend that a minimum 66 inches of properly placed and compacted select fill material be constructed immediately beneath the floor slab as a means to reduce swell potential. This depth is expected to remove existing fill to depths shown in the borings, however, existing fill could be present at greater depths between boring locations. Our Geotechnical Engineer should evaluate subgrade conditions at time of excavation to determine if additional excavation of existing fill below the recommended overexcavation

depth is appropriate. Select fill should extend horizontally a minimum distance of 5 feet beyond the outside edge of the building footprint.

Fill Material Types

Fill required to achieve design grade should be classified as select fill and general fill. Select fill is material used below, or within 5 feet of structures. General fill is material used below pavements.

Soil Type	USCS Classification	Acceptable Locations
Select Fill [1]	Lean Clay (CL) or Clayey Sand (SC) 10≤PI≤20	Recommended to construct the select fill building pad beneath grade-supported slabs. Select fill should also be considered below exterior flatwork to reduce potential movements.
General Fill	Varies	The on-site soils, including the fill soils, appear suitable for use as fill within the pavement areas, provided they are free of organics and debris.

1. Select fill should consist of approved materials free of organic matter and debris. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

If blended or mixed soils are intended for use as fill, Terracon should be contacted to provide additional recommendations. These soils are a blend of sand and clay and will require mechanical mixing at the site with a pulvimixer. If these soils are not mixed thoroughly to break down the clay clods and blend-in the sand to produce a uniform soil matrix, the fill material may be detrimental to the performance of the foundations. Blending soils on the site will be particularly challenging due to the variability of the near surface soils which would require frequent reconfiguration of the proportions of the soils being blended. If blended soils are used, we recommend that additional samples of the blended soils as well as the clay clods, be obtained prior to and during earthwork operations to evaluate if the blended soils can be used in lieu of select fill. The actual type and amount of mechanical mixing at the site will depend on the amount of clay and sand, and properties of the clay.

Fill Compaction Requirements

Select and general fill should meet the following compaction requirements.

Item	Select Fill and General Fill
Fill lift thickness	The fill soils should be placed on prepared surfaces in lifts not to exceed 8 inches loose measure, with compacted thicknesses not to exceed 6 inches.
Compaction requirements	■ Select fill and on-site soils should be compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density. ■ Select fill soils and lean clay soils should be moisture adjusted to within 2 percent of the optimum moisture content. ■ On-site fat clay soils should be moisture conditioned to between optimum and +4 percent of the optimum moisture content.

Prior to any filling operations, samples of the proposed borrow and on-site materials should be obtained for laboratory moisture-density testing. The tests will provide a basis for evaluation of fill compaction by in-place density testing. A qualified soil technician should perform sufficient in-place density tests during the filling operations to evaluate proper levels of compaction, including dry unit weight and moisture content, are being attained.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

During seasons of significant rainfall, the groundwater table could affect overexcavation efforts, especially for overexcavation and replacement of lower strength soils. A temporary dewatering system consisting of sumps with pumps may be necessary to achieve the recommended depth of overexcavation depending on groundwater conditions at the time of construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation

and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Drilled-and-Underreamed Footings

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for drilled-and-underreamed footings.

Drilled-and-Underreamed Footings Design Parameters – Compressive Loads

Item	Description
Minimum embedment depth [1]	10 feet below existing grade
Allowable bearing pressures [2, 3]	Net dead plus sustained live load – 2,400 psf Net total load – 3,600 psf
Maximum underream-to-shaft diameter ratio	3:1
Minimum underream-to-shaft diameter ratio [4]	2:1
Approximate post-construction settlement [5]	1 inch or less
Uplift resistance [6]	Foundation Weight (150 pcf) Soil Weight (120 pcf)

1. The footings should bear within the native undisturbed clay soils.
2. Whichever condition yields a larger bearing area.
3. The allowable bearing pressure for dead load plus sustained live load values include a factor of safety of 3 and the allowable bearing pressure for total load values include a factor of safety of 2.
4. This minimum underream-to-shaft diameter ratio should result in a large enough diameter of the underream to overcome uplift forces on the footing without causing local soil failure to the overlying soils.
5. This estimated post-construction settlement of the drilled-and-underreamed footings is without considering the effect of stress distribution from adjacent

Item	Description

foundations and assuming proper construction practices are being followed. A clear distance between the footings of one underream diameter of the larger footing should be provided between the underreams to develop the recommended bearing pressures and to control settlements. If a clearance of one diameter cannot be maintained in every case, the above bearing capacities should be reduced by 20 percent for a clearance between one half and one underream diameters. Underreams closer than a clearance of one half of an underream diameter are not recommended.

6. Structural uplift loads on the drilled-and-underreamed footings will be resisted by the dead weight of the footings and supported structure plus the weight of a soil wedge above the footing. The soil wedge can be assumed to extend upward from the bottom of the underream at a slope of 4 vertical to 1 horizontal.

Drilled-and-Underreamed Footings - Construction Considerations

Drilled excavations to a depth of 10 feet below existing grade will be necessary for installation of drilled-and-underreamed footings for the proposed building planned at this site. The borings in the building area generally have clay soils which should support underreaming efforts. The excavations should be performed with equipment capable of providing a relatively clean bearing area. The presence of secondary structures such as ferrous and calcareous nodules, slickensides etc., can cause sloughing during footing excavation. Thus, the drilling contractor should have casing available in the event that sloughing causes improperly formed piers.

Based on our groundwater information obtained during our field activities, groundwater seepage is not expected to be a major concern during construction of the foundations at the recommended bearing depth. However, depending on climatic conditions, groundwater levels may vary from the levels observed during our field program. Water must not be allowed to accumulate in the bottom of the footing excavations. The contractor should be prepared to remove water from the drilled footings, if necessary. To reduce the potential for water seepage into the footing excavation and to minimize disturbance to the bearing area, we recommend that concrete and steel be placed as soon as possible after footing excavations are completed. Preferably, footing excavations should be backfilled with concrete within about 2 to 4 hours of completion of the drilling and in no case should an excavation be left open overnight. The concrete placed in the excavations should have a slump consistent with drill method in accordance with ACI 336.1. The bottom of each footing excavation should be free of all loose materials and/or water, and the bearing surface should be evaluated immediately prior to placing concrete.

Shallow Foundations

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Shallow Footings Design Parameters – Compressive Loads

Item	Individual Column	Continuous Wall
Maximum Net Allowable Bearing Pressure, Dead Load Plus Sustained Live Load [1, 2, 3]	1,500 psf	1,200 psf
Maximum Net Allowable Bearing Pressure, Total Load [1, 2, 3]	2,300 psf	1,800 psf
Required Bearing Stratum [4]	Properly placed and compacted select fill Bearing stratum to be verified by Terracon	
Minimum Foundation Dimensions	Per IBC 1809.7	
Allowable Passive Pressure Resistance [5]	200 psf/foot	
Sliding Resistance [6]	250 psf allowable	
Minimum Embedment below Finished Grade [7]	4 feet	
Estimated Total Settlement from Structural Loads [2]	About 1 inch	
Estimated Differential Settlement [2, 7]	About ½ of total settlement	

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 20% within 10 feet of the proposed structure.
2. Values provided are for maximum loads of 150 kips or foundation dimensions less than 10 feet by 10 feet. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. The allowable bearing pressure for dead load plus sustained live load values include a safety of at least 3. The allowable bearing pressure for total load values include a factor of safety of at least 2.
4. Unsuitable or soft soils, if encountered, should be undercut and replaced per the recommendations presented in **Earthwork**.
5. Use of passive earth pressures requires the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted select fill be placed against the vertical footing face. The allowable passive resistance should be distributed as a uniform pressure and includes a factor of safety of at least 2.

Item	Individual Column	Continuous Wall

6. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations. For fine-grained materials, lateral resistance using cohesion should not exceed ½ the dead load.
7. Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
8. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 10 feet.

Shallow Footings Design Parameters – Overturning and Uplift Loads

Shallow foundations subjected to overturning loads should be proportioned such that the resultant eccentricity is maintained in the center-third of the foundation (e.g., e < b/6, where b is the foundation width). This requirement is intended to keep the entire foundation area in compression during the extreme lateral/overturning load event. Foundation oversizing may be required to satisfy this condition.

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils with consideration to the IBC basic load combinations.

Item	Description
Soil Moist Unit Weight	115 pcf
Soil Effective Unit Weight[1]	53 pcf
Soil weight included in uplift resistance	Soil included within the prism extending up from the top perimeter of the footing at an angle of 20 degrees from vertical to ground surface

1. Effective (or buoyant) unit weight should be used for soil above the foundation level and below the recommended groundwater level. We recommend for this project that the ground water level should be assumed to reach the ground surface for the calculation of resistance of uplift pressures.

Shallow Footings Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry

material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

Soils exposed at the surface of footing excavations may require surficial compaction with hand-held dynamic compaction equipment prior to placing select fill, steel, and/or concrete. Should surficial compaction not be adequate, construction of a working surface consisting of either crushed stone or a lean concrete mud mat may be required prior to the placement of reinforcing steel and construction of foundations.

Water should not be allowed to accumulate at the bottom of the foundation excavations. To reduce the potential for groundwater seepage into the excavations and to minimize disturbance to the bearing area, we recommend that steel and concrete be placed as soon as possible after the excavations are completed and properly cleaned. Excavations should not be left open for more than 24 hours. The bearing surface of the foundations should be evaluated immediately prior to placing concrete.

A thin seal slab (approximately 2 to 4 inches thick) should be placed at the bottom of the footing excavation to protect the bearing surface of the footing from disturbance if the footing cannot be poured within 24 hours following excavation.

Deep Foundations

Drilled Shaft Design Parameters

Allowable skin friction and end bearing values are provided below in the following table for the design of drilled shaft foundations. These design parameters were computed based on generalized soil profile and engineering properties of the subsurface soils observed within the depths explored at this site.

Drilled Shaft Design Summary [1, 4]

Depth Below Existing Grade (feet)	Allowable Skin Friction (psf) [2]	Allowable End Bearing Pressure (psf) [2, 3]
0 – 4	Disregard	Disregard
4 – 10	220	Disregard
10 – 18	275	Disregard
18 – 22	550	6,000
22 – 40	660	7,200

Drilled Shaft Design Summary [1, 4]

Depth Below Existing Grade (feet)	Allowable Skin Friction (psf) [2]	Allowable End Bearing Pressure (psf) [2, 3]

1. Design capacities are dependent upon the method of installation and quality control parameters. The values provided are estimates and should be verified when installation protocol have been finalized. No adjustment has been made for grade raising.
2. The allowable skin friction includes a factor of safety of 2 and the allowable end bearing pressure includes a factor of safety of 3.
3. Shafts should extend a minimum of 2 feet into the desired bearing stratum with a minimum 4 feet of the selected bearing stratum below the bottom for the end bearing values to be considered.
4. Groundwater level estimated at a depth of about 22 feet.

There are numerous factors which contribute to the behavior of groups subjected to axial load. Several of these factors are foundation type, size and length, spacing, overall group size, loading conditions, installation procedures and soil type and strength. We recommend a minimum spacing of three diameters, center-to-center, for shafts placed in groups beneath square or rectangular caps. However, for shafts placed in a linear pattern beneath load bearing walls, a minimum spacing of two diameters, center-to-center, would generally be acceptable. Closer spacing than three diameters in groups or two diameters in rows could result in increased group settlement and a reduction of load-carrying capacity of individual foundation elements.

Settlement of a single, isolated shaft will depend on the elastic properties of the foundation, the applied load, and the interaction of the soil and foundation. Settlement is anticipated to be primarily elastic and will occur relatively soon as load is applied. Significant consolidation settlement due to applied load is not anticipated for the allowable capacities. Our experience indicates that a single, isolated foundation loaded to about one-half of its ultimate capacity will result in settlements of about 1 inch or less. Groups generally undergo more settlement than single, isolated foundation elements for the same applied load. Based on the above recommended spacing, we anticipate that settlement of a group will be on the order of 1 inch under working loads with differential settlement between foundations to be about ½ inch of the total settlement.

Drilled shaft foundations will provide resistance to structural uplift loads through the mobilization of the skin friction acting at the interface of the shaft sidewall and the adjacent soils. The allowable skin friction values provided in the previous table with a reduction of 30% may be used to calculate the uplift resistance for the shafts.

Drilled Shaft Lateral Loading

The following table lists input values for use in LPILE analyses for either ACIP piles or drilled shaft foundations. Modern versions of LPILE provide estimated default values of k_h and E_{50} based on strength and are recommended for the project. Since deflection or a service limit criterion will most likely control lateral capacity design, no safety/resistance factor is included with the parameters. We recommend that fill used for grade raising be neglected in analysis of lateral resistance.

Bottom Soil layer (feet)[1]	LPILE Soil Model	S_u (psf)[2]	ϕ[2]	γ' (pcf)[2]	ε_{50}	K (pci)	
						Static	Cyclic
4	Neglect						
10	Stiff Clay w/o Free Water	800	---	115	Use Default Value		
18	Stiff Clay w/o Free Water	1,000	---	115	Use Default Value		
22	Stiff Clay w/o Free Water	2,000	---	58	Use Default Value		
40	Stiff Clay w/o Free Water	2,400	---	58	Use Default Value		

1. See Depth below existing grade at the time of our field program.
2. Definition of Terms:
   S_u: Undrained shear strength
   ϕ: Internal friction angle
   γ': Effective unit weight

Drilled Shaft Construction Considerations

The drilling contractor should be experienced in the subsurface conditions observed at the site, and the excavations should be performed with equipment capable of providing a relatively clean bearing area. The drilled straight shaft foundations should be installed in general accordance with the procedures presented in "Standard Specification for the Construction of Drilled Piers", ACI Publication No. 336.1-01.

The successful completion of drilled shafts will depend to a large extent on the suitability of the equipment and the operator's skills. The operation sequence should be scheduled so that the shaft excavations can be completed, reinforcing steel placed, and the concrete poured in a continuous, rapid, and orderly manner to minimize the time the excavations are open. Concrete should be placed as soon as practical and should be placed within the same day. Concrete should be poured with a tremie.

Based on the subsurface conditions observed, the installation of drilled shafts may require the use of the Slurry Displacement Method and/or temporary steel casing due to the presence of slickensided clays. If drilled shaft installation is attempted without

utilizing Slurry Displacement Method or temporary casing, zones of sloughing soils and/or groundwater inflow may occur during construction. Therefore, we recommend that provisions be incorporated into the plans and specifications to utilize slurry or casing to control sloughing and/or groundwater seepage during shaft construction.

The need for casing or slurry will depend on the depth of the drilled shaft and the groundwater conditions at the time of construction. If casing is used and seepage persists, water accumulating in the foundation excavation should be pumped out. The condition of the bearing surface should be evaluated immediately prior to placing concrete, if casing is used in lieu of slurry. If groundwater inflow is too severe to be controlled by the use of casing and pumping or significant sloughing of the sidewalls occurs, the slurry method of construction should be utilized to complete the foundation installation.

Where casing is used, removal of the casing should be performed with extreme care and under proper supervision to minimize mixing of the surrounding soil and water with the fresh concrete. Rapid withdrawal of the casing may develop a suction that could cause the soil and water to flow into the excavation. An insufficient head of concrete in the casing during withdrawal could also allow the water to intrude into the wet concrete. Under no circumstances should loose soil be placed in the annulus between the casing and the drilled shaft sidewalls. The casing must be removed in order to utilize the skin friction values previously provided.

During slurry displacement, the foundation excavation is filled with a slurry mixture. The level of slurry should be maintained above the groundwater level to maintain a positive head in the foundation excavation. Therefore, the slurry tends to seep out of the excavation, rather than the groundwater seeping into the open excavation. The slurry must be maintained in the foundation excavation until design termination depth is achieved and should be removed only as concreting proceeds. The properties of the slurry including the density, viscosity, and pH must be carefully controlled and should be in accordance with Item 416 of Texas Department of Transportation (TXDOT) Standard Specifications for Construction of Highways, Streets, and Bridges.

Slurry left in place for long periods of time will build up on the sides of the shaft causing a reduction in skin friction.

The following procedures and equipment are recommended for installation of drilled shafts by the Slurry Displacement Method:

- The bottom of the drilled straight shaft should be cleaned as well as practical just prior to concreting to remove cuttings.
- The concrete should be placed by means of a tremie with a one-way valve to prevent slurry from entering the pipe. The tremie should extend to the bottom

of the drilled shaft to allow displacement of the slurry during concrete placement.

- During concrete placement, the end of the tremie should remain several feet within the concrete mass to reduce the entrapment of slurry. A tremie embedment of 5 to 10 feet is generally considered acceptable.
- The concrete should be relatively fluid to reduce the entrapment of slurry.
- The upper few feet of concrete should be expunged from the shaft excavation if found to be contaminated with slurry or soil.

Production shaft installation should be closely monitored by a qualified technician experienced in drilled shaft installation techniques. Quality control testing including crosshole sonic logging (CSL) or thermal integrity profiling (TIP) is conducted to assess shaft sidewall integrity and indicate that casing withdrawal or problems with the slurry displacement method have not resulted in sidewall collapse. At a minimum, the technician should observe shaft excavation, note any unusual installation occurrences, observe slurry properties and/or casing installation and removal, observe concrete placement and generally evaluate if shaft installation is being performed in accordance with project specifications.

Floor Slabs

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the building and select fill soils beneath the floor slab.

Planned finished grades for the proposed building were not available at the time of this report. We anticipate that the finished floor elevation of the proposed building is planned to be within 2 feet above existing grade. If the grading is planned to be altered from what has been previously described, Terracon should be notified to review and/or modify our recommendations given in this subsection.

The near-surface soils observed at this site generally exhibit a high expansion potential. These soils can subject the interior floor slab of the building to significant movements (due to shrinking and swelling) with fluctuations in their moisture content. This movement potential is influenced primarily by the properties of the subgrade soils, as well as the moisture content of the subgrade at the time of construction, overburden pressures, and the stability of the moisture contents throughout the life of the building. Based on the information developed from our field and laboratory programs and on method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, we estimate that the subgrade soils at this site exhibit a Potential Vertical Rise (PVR) of up to approximately 5 inches. Therefore, we recommend that the near-surface soils be prepared as stated below to reduce the potential for slab

movement associated with volumetric changes of the near-surface clay soils due to moisture variations to a more acceptable level. The actual movements could be greater if poor drainage, ponded water, and/or other sources of moisture are allowed to infiltrate beneath the structure after construction.

The most common method of subgrade preparation to reduce potential expansion of the subgrade would be to provide a pad of properly placed and compacted select fill beneath the grade-supported floor slabs. The corresponding decrease in the potential soil movements is primarily a function of the fill pad thickness and the moisture levels of the underlying clay subgrade. While the indicated preparations do not eliminate the potential for soil movement, the magnitude of such movements should be reduced to more acceptable levels. To provide uniform support to the floor slab and to reduce the estimated PVR to approximately 1 inch or less, we recommend that a minimum 66-inches of properly placed and compacted select fill material be constructed immediately beneath the floor slab. The select fill pad should extend a minimum of 5 feet beyond the edge of the building area. The final exterior grade adjacent to the structure should be sloped to promote effective drainage away from the structure.

Select fill should be utilized for all grade adjustments within the proposed building area. The subgrade and select fill soils should be prepared as outlined in the **Earthwork** section of this report, which contains material and placement requirements for select fill, as well as other subgrade preparation recommendations.

The subgrade soils for flatwork outside of the structure which will be sensitive to movement should be prepared as discussed previously. This preparation will be important on surrounding sidewalks and paving immediately adjacent to the structure. If these adjacent flatwork areas are not prepared as stated above for the building area, the estimated PVR for these areas could approach those indicated previously for in-situ conditions. If the soils swell in these areas, this movement could result in significant distress to the adjacent sidewalks and paving and possibly result in reversed drainage (flow of runoff toward the structure) around the perimeter of the structure.

Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	Subgrade compacted to recommendations in **Earthwork**
Estimated Modulus of Subgrade Reaction [2]	100 pounds per square inch per inch (psi/in) for point loads

Item	Description

1. Floor slab should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

Detention Pond Construction Considerations

The soils observed at borings B-04 to B-06 generally consisted of fat clay soils. These soils should support sideslopes for a maximum excavation depth of 15 feet on declinations of 4H:1V or flatter. Terracon should be contacted for additional services if the bottom of the ponds is deepened and/or if the sideslopes are planned to be steeper than 4H:1V.

Groundwater Control

Based on our field observations, groundwater was not observed within the planned maximum excavation depth of 15 feet. Therefore, groundwater is not expected to be a major concern during construction of the detention pond. However, depending on climatic conditions, groundwater levels may vary from the level observed during our field program and minor seepage could be observed within the excavation depths. We anticipate that the seepage in the clayey soils can be handled with sumps and pumps positioned in the bottom of the excavations.

The suggested method given above serves as a guideline for groundwater control; other appropriate means may be required for groundwater control during construction. Control of groundwater should be accomplished in a manner that will preserve the strength of the soils, will not cause instability of the excavation, and will not result in damage to existing structures, if any.

To further evaluate the groundwater conditions in the area of the proposed pond, piezometers may be installed, or trenches or pits may be excavated to the planned excavation depth. Based on those results, the contractor should determine effective methods of groundwater managements prior to starting excavation operations.

Slope Protection and Erosion Control

If water flow is permitted along the sideslopes of the pond, the near-surface soils will likely erode, causing gradual steepening and subsequent sloughing of the sideslopes. Therefore, the sideslopes should be protected against sheet flow down the banks or concentrated high velocity water flow. Measures to protect the sideslopes may include slope paving, rip-rap, geofabrics, or even vegetation with an aggressive root system. Routine maintenance of the sideslopes should be performed to reconstruct areas where sloughing and/or erosion have occurred.

Potential Use of Excavated Soil

The soils observed in the area of the proposed detention pond include high plasticity clay soils. The plasticity indices of the soils observed typically ranged from 59 to 72. The soils

observed at this site do not meet the requirements for select fill (clay soils with a plasticity index ranging between 10 and 20) but may be used for grade adjustments in the pavement areas provided they are free of any organics and/or debris.

Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils observed on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Our opinion of pavement section thickness design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein using methodology contained in ACI 330 "Guide to Design and Construction of Concrete Parking Lots" and NAPA IS-109 "Design of Hot Mix Asphalt Pavements" and adjusted with consideration to local practice. Our pavement design has considered the following traffic levels in association with these design methods:

Asphalt (NAPA IS-109)

- Class I: Parking stalls for autos and pickup trucks
- Class II Traffic consisting of buses, delivery trucks and trash pickup

Portland Cement Concrete (ACI 330-21)

- Category A Car parking and access lanes (1 truck per day)
- Category C Buses
- Category E Garbage and fire truck lanes

The top 6 inches of the finished subgrade soils directly beneath the pavements should be chemically treated with lime. The decision about the type and proper amount of additive should be made after the subgrade is open for inspection. Chemical treatment will increase the supporting value of the subgrade and decrease the effect of moisture on subgrade soils. This 6 inches of treatment is a required part of the pavement design and is not a part of the site and subgrade preparation for wet/soft subgrade conditions.

Pavement Section Thicknesses

Listed below are pavement component thicknesses, which may be used as a guide for pavement systems at the site for the traffic classifications stated herein. These systems were derived based on general characterization of the subgrade. Specific testing (such as CBR's, resilient modulus tests, etc.) was not performed for this project to evaluate the support characteristics of the subgrade.

Asphaltic Concrete Pavement [1]

Layer	Thickness (inches)	
	Traffic Class I [1]	Traffic Class II [1]
Asphaltic Concrete	2	3
Aggregate Base	8	10
Treated Subgrade	6	6

1. See **Project Description** for more specifics regarding traffic assumptions.

The asphaltic concrete sections above should not be used in locations where emergency vehicles, which are permitted to exceed roadway weight limits, may travel

Portland Cement Concrete Pavement [1]

Layer	Thickness (inches)		
	Traffic Category A [1]	Traffic Category C [1]	Traffic Category E [1]
Concrete	5	8	7
Treated Subgrade	6	6	6

1. See **Project Description** for more specifics regarding traffic classifications.

The concrete pad in waste dumpster areas should be designed so that the vehicle wheels of the collection truck are supported on the concrete while the dumpster is being lifted to support the large wheel loading imposed during waste collection.

Presented below are our recommended material requirements for the various pavement sections.

Concrete Pavement – The materials and properties of concrete pavement including joint requirements should meet applicable requirements in ACI 330-21 *Commercial Concrete Parking Lots and Site Paving Design and Construction - Guide*. The thickness of concrete

has been developed based on a minimum modulus of rupture of 550 psi which typically correlates to a portland cement concrete mix design with a minimum 28-day compressive strength of 3,500 psi. If submitted concrete mix designs indicate a varying modulus of rupture and compressive strength will be used, Terracon should be contacted to revise the concrete thicknesses.

If river gravel is planned to be utilized in the portland cement concrete mix, Terracon should be contacted for additional services. The presence of river gravel in the portland cement concrete mix can result in excessive cracking and distress to the concrete pavement as a result of differing thermal expansion properties between the river gravel and cement paste. Special care should be taken in developing the project's portland cement concrete mix design, joint layout, and placement to help reduce the potential for excessive cracking and distress if river gravel is planned to be utilized for the project.

Reinforcing Steel – ACI 330-21 indicates that distributed steel reinforcement is not necessary when the pavement is properly jointed to form short panel lengths that will help reduce intermediate cracking. Use of distributed steel is common in the area, mostly as continuation of historical practice. In shrink/swell-prone areas, distributed steel can limit some abrupt differential movement of adjacent panels subjected to differing soil moisture conditions (such as near pavement openings susceptible to infiltration or near the root system of trees). Provided the concrete pavement is designed and constructed as stated herein, the installation of reinforcing steel is optional and should be evaluated by the design team in conjunction of City requirements. Proper layout and installation of the joints within the pavement is critical to help control intermediate cracking.

If reinforcing steel is planned to be utilized in the concrete pavement by the design team, the following amount of reinforcing steel should be used as a general guideline:

Class A: #3 bars spaced at 18 inches or #4 bars spaced at 24 inches on centers in both directions.
Class C: #4 bars spaced at 12 inches on centers in both directions.
Class E: #4 bars spaced at 12 inches on centers in both directions.

Hot Mix Asphaltic Concrete Surface Course – The asphaltic concrete surface course should be plant mixed, hot laid Type D (Fine Graded Surface Course) meeting the requirements in TxDOT 2014 Standard Specifications Item 340.

Base Material – Base material should be composed of crushed limestone or crushed concrete meeting the requirements of TxDOT 2014 Standard Specifications Item 247, Type A or D, Grade 1-2. The base material should be compacted to at least 95 percent of the Modified Effort (ASTM D1557) maximum dry density at moisture content within 2 percent of the optimum moisture content.

Lime Treated Subgrade – The medium to high plasticity clay fill soils should be treated with lime in accordance with the TXDOT 2014 Standard Specifications Item 260. The amount of lime should be determined for subgrade soils by conducting laboratory tests just prior to construction. Based on the classification test results, we recommend that about 8 to 10 percent lime by dry weight be used for estimating and planning. The percentages are given as application by dry weight and are typically equivalent to about 40 to 50 pounds of lime per square yard per 6-inch depth. The pulverization, mixing and curing of the lime treated subgrade is of particular importance in these clays. The subgrade should be compacted to a minimum of 95 percent of the Standard Effort (ASTM D 698) maximum dry density at a moisture content between optimum and 4 percent wet of the optimum moisture content.

Preferably, traffic should be kept off the treated subgrade for 7 days to facilitate curing of the soil-chemical mixture. In addition, the subgrade is not suitable for heavy construction traffic prior to paving.

The pavement design methods described above are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade such as the soils encountered at this site. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade. Post-construction subgrade movements and some cracking of pavements are not uncommon for clay subgrade conditions such as those observed at this site. Reducing moisture changes in the subgrade is important to reduce shrink/swell movements. Although chemical treatment will help to reduce such movement/cracking, this movement/cracking cannot be economically eliminated.

Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

Pavement Maintenance

Long-term pavement performance will be dependent upon several factors, including maintaining subgrade moisture levels and providing for preventative maintenance. The following recommendations should be implemented to help promote long-term pavement performance:

- The subgrade and the pavement surface should be designed to promote proper surface drainage, preferably at a minimum grade of 2 percent,
- Install joint sealant and seal cracks immediately,

- Extend curbs into the treated subgrade for a depth of at least 4 inches to help reduce moisture migration into the subgrade soils beneath the pavement section, and
- Place compacted, low permeability clayey backfill against the exterior side of the curb and gutter.

Preventative maintenance should be planned and provided for the pavements at this site. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and consist of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Prior to implementing any maintenance, additional engineering observations are recommended to determine the type and extent of preventative maintenance.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost

estimator as there may be variations on the site that are not apparent in the data that could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

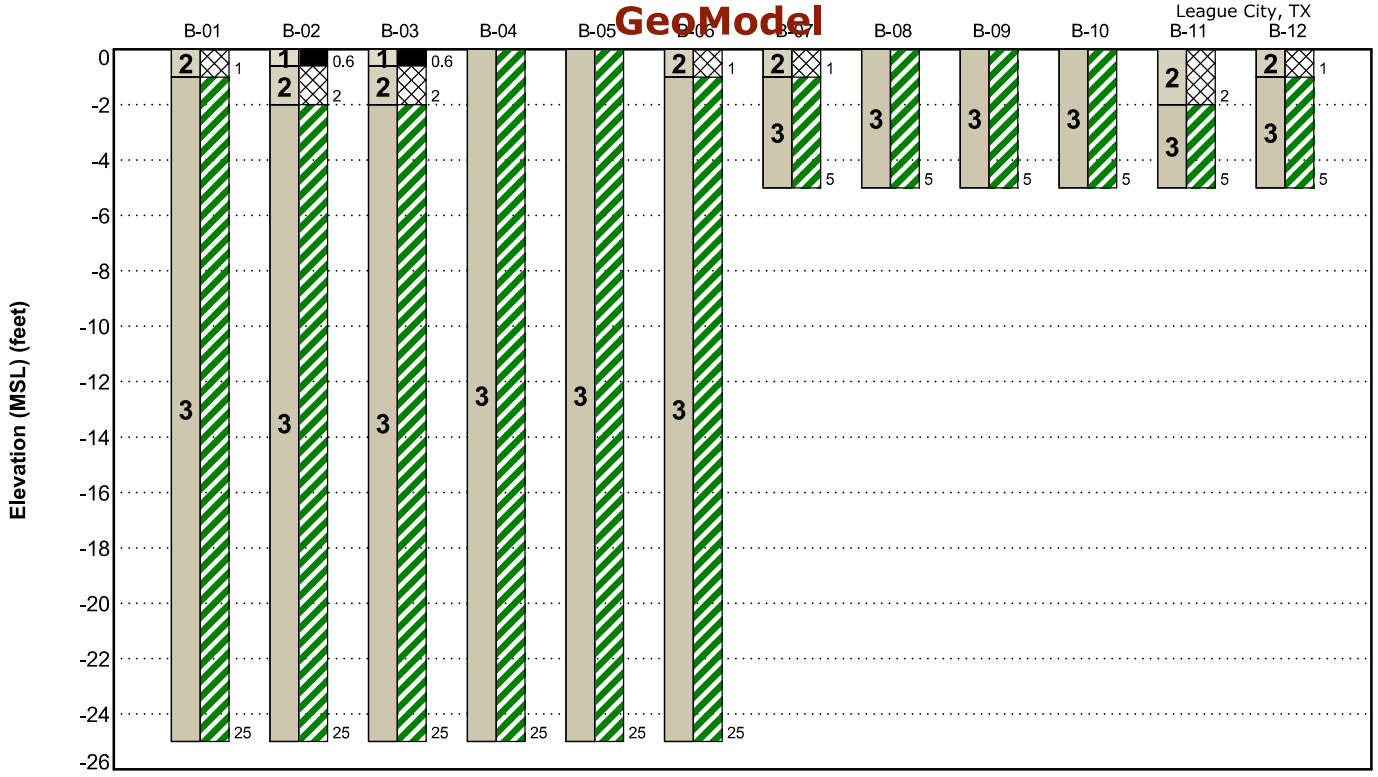
Figures

Contents:

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Pavement	approximately 1 to 2 inches of asphaltic concrete overlying about 6 inches of crushed stone
2	Fill - Fat Clay	dark gray, tan, and light gray, with ferrous and calcareous nodules, and slickensides
3	Fat Clay	dark gray, gray, tan, and light gray, medium stiff to very stiff, with ferrous and calcareous nodules, and slickensides

LEGEND

Fill
Fat Clay
Asphalt

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Type of Exploration	Boring/CPT Number	Approximate Depth (feet)	Location
Soil borings	B-01 to B-03	25	Building area
CPT soundings	CPT-01 to CPT-06	34 to 41	Building area
Soil borings	B-04 to B-06	25	Detention pond
Soil borings	B-07 to B-12	5	Pavement areas

Boring and CPT Layout: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±25 feet) along with referencing existing site features.

Subsurface Exploration Procedures: We advanced the soil borings with a truck-mounted drill rig using continuous mud-rotary drilling techniques. Samples were obtained continuously every 2 feet in the upper 12 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. For safety purposes, all borings were backfilled with auger cuttings after their completion.

An automatic SPT hammer was used in advancing the split-spoon sampler at the borings. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT N-values and soil properties are based on the lower efficiency cathead and rope method. The higher efficiency of an automatic SPT hammer affects the SPT N-value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method.

We also observed the boreholes while drilling for the presence of groundwater. The groundwater levels are shown on the attached boring logs.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and

taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Cone Penetrometer Testing

The CPT hydraulically pushes an instrumented cone through the soil while nearly continuous readings are recorded to a portable computer. The cone is equipped with electronic load cells to measure tip resistance and sleeve resistance and a pressure transducer to measure the generated ambient pore pressure. The face of the cone has an apex angle of 60° and an area of 10 cm^2. Digital data representing the tip resistance, friction resistance, pore water pressure, and probe inclination angle are recorded about every 2 centimeters while advancing through the ground at a rate between 1½ and 2½ centimeters per second. These measurements were correlated to various soil properties used for geotechnical design.

CPT testing was conducted in general accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."

Upon completion, the data collected was downloaded and processed by a geotechnical engineer.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture content
- Atterberg limits
- Dry unit weight
- Unconfined compression

Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System (USCS).

Site Location and Exploration Plans

Contents:

Site Location

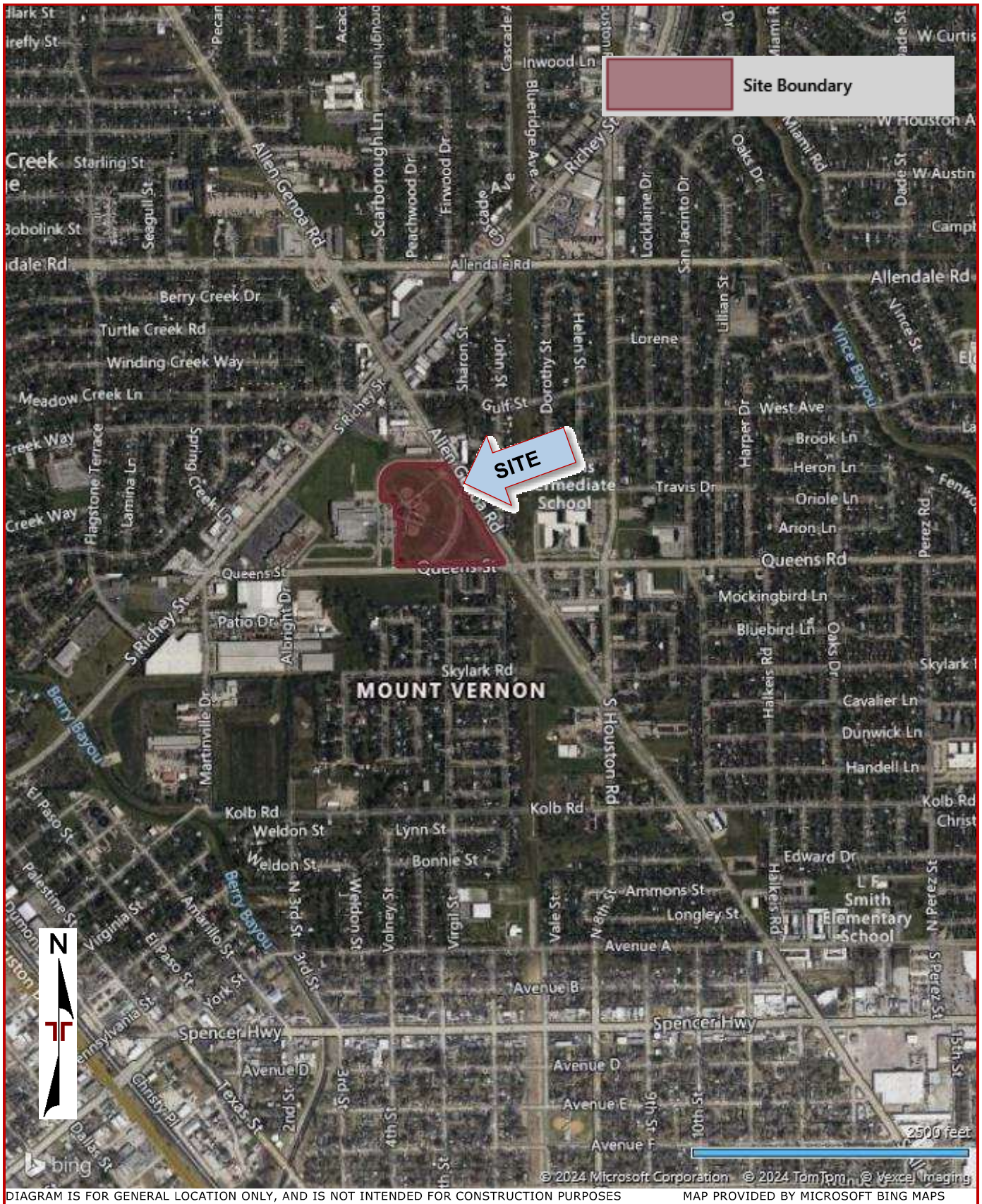


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

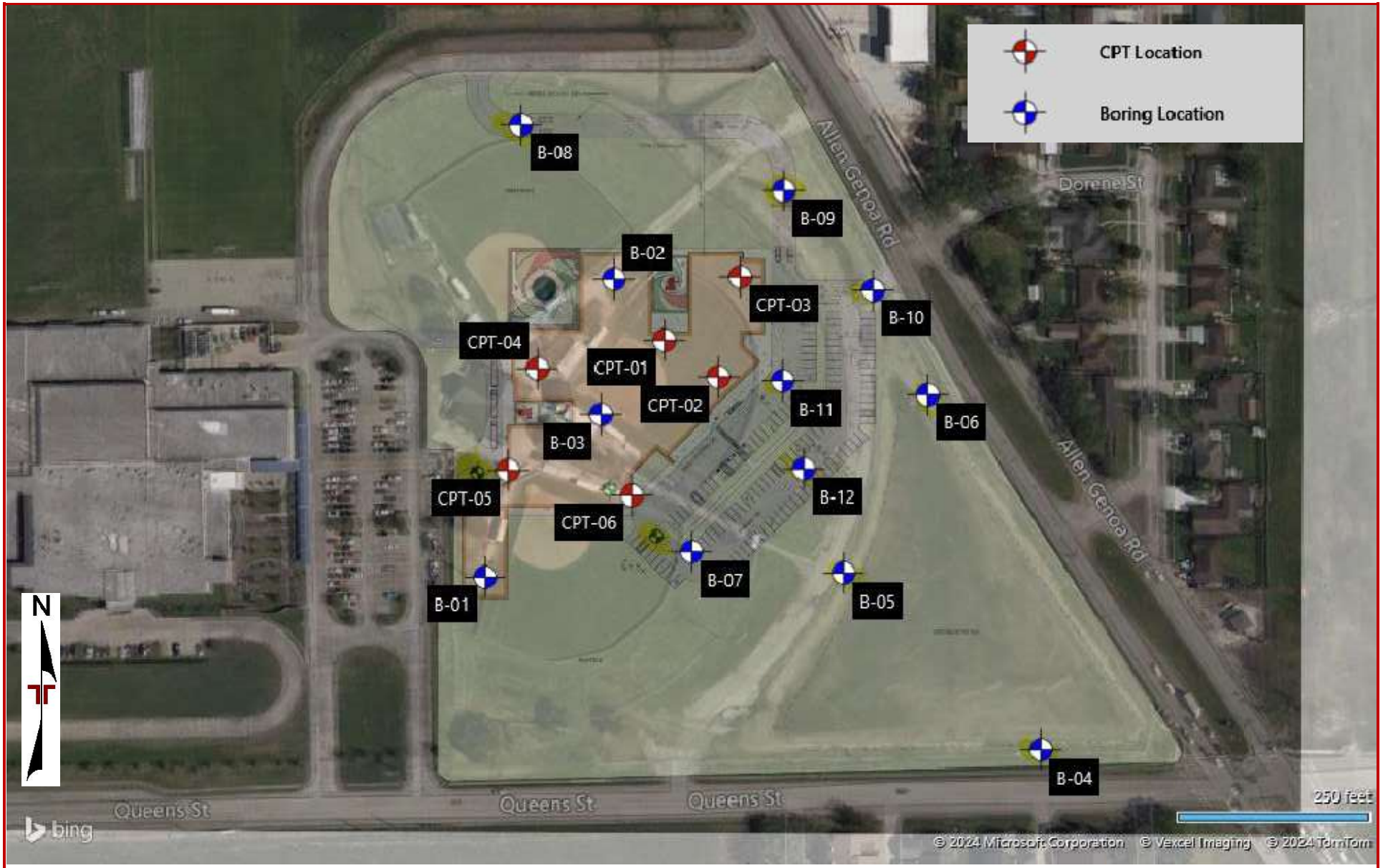


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-01

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6766° Longitude: -95.2274° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
2		**FILL - FAT CLAY (CH)**, dark gray and tan, with ferrous nodules and crushed stone 1.0				2.0 (HP)				24.0		74-25-49	
3		**FAT CLAY (CH)**, dark gray, medium stiff to very stiff, with ferrous nodules and slickensides				1.0 (HP)							
		- gray and tan 4 to 10 feet	5			1.5 (HP)	UC	0.71	7.3	36.9	83		
						1.5 (HP)							
						1.5 (HP)	UC	0.76	3.9	38.6	83	77-28-49	
		- tan and light gray, with calcareous nodules 10 to 25 feet	10			2.0 (HP)							
						3.0 (HP)	UC	0.60	1.4	27.9	94		
			15										
						3.0 (HP)							
			20										
						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
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-02

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6777° Longitude: -95.2268° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		0.6 **PAVEMENT**, approximately 2 inches of asphaltic concrete overlying about 6 inches of crushed stone											
2		**FILL - FAT CLAY (CH)**, dark gray, tan, and light gray, with ferrous and calcareous nodules 2.0				2.0 (HP)							
3		**FAT CLAY (CH)**, gray and tan, medium stiff to very stiff, with ferrous nodules and slickensides				2.0 (HP)	UC	0.64	6.8	42.2	77	93-32-61	
			5			1.5 (HP)							
						1.5 (HP)	UC	0.77	4	33.8	84	101-26-75	
		- with calcareous nodules 8 to 25 feet				2.0 (HP)							
		- tan and light gray 10 to 25 feet	10			3.0 (HP)	UC	1.16	6	30.2	90		
						3.0 (HP)							
			15										
						3.5 (HP)	UC	1.54	6.6	27.6	94	72-25-47	
			20										
						3.0 (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
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-03

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6772° Longitude: -95.2269° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		0.6 **PAVEMENT**, approximately 1 inch of asphaltic concrete overlying about 6 inches of crushed stone											
2		**FILL - FAT CLAY (CH)**, reddish brown, gray, and tan, with ferrous and calcareous nodules 2.0				1.0 (HP)				32.3		77-28-49	
3		**FAT CLAY (CH)**, gray, medium stiff to very stiff, with ferrous nodules and slickensides				1.5 (HP)							
		- gray and tan 4 to 10 feet	5			1.5 (HP)	UC	0.82	9.3	41.1	78	98-30-68	
						2.0 (HP)							
		- with calcareous nodules 8 to 25 feet				2.0 (HP)							
		- tan and light gray 10 to 25 feet	10			2.5 (HP)	UC	0.78	3.2	33.0	87	83-29-54	
						2.5 (HP)							
			15										
						3.0 (HP)							
			20										
						3.0 (HP)	UC	1.57	2.4	29.3	92		
		25.0 ***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
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-04

Location: See Exploration Plan

Latitude: 29.6760° Longitude: -95.2251°

Model Layer	Graphic Log	Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
3			**FAT CLAY (CH)**, gray, medium stiff to very stiff, with ferrous nodules and slickensides			4.5 (HP)							
						1.5 (HP)	UC	0.72	4.9	36.3	83	97-27-70	
		5				2.0 (HP)							
			- tan and light gray 6 to 25 feet			1.5 (HP)							
			- with calcareous nodules 8 to 25 feet			2.0 (HP)	UC	1.03	3.1	34.8	86	90-30-60	
		10				2.5 (HP)							
						2.5 (HP)							
		15											
						3.5 (HP)	UC	2.16	6.3	27.0	96		
		20											
						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
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-05

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6766° Longitude: -95.2259° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
3		**FAT CLAY (CH)**, gray, medium stiff to very stiff, with ferrous nodules and slickensides				1.0 (HP)							
						1.5 (HP)							
		- gray and tan 4 to 8 feet	5			2.5 (HP)	UC	0.76	1.1	33.9	85	98-26-72	
		- with calcareous nodules 6 to 25 feet				2.0 (HP)							
		- tan and light gray 8 to 25 feet				2.0 (HP)							
			10			2.5 (HP)	UC	0.89	3.3	33.4	88		
						2.5 (HP)							
			15										
						2.5 (HP)							
			20										
						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
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-06

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6773° Longitude: -95.2255° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
2		**FILL - FAT CLAY (CH)**, dark gray and tan, with ferrous and calcareous nodules				1.0 (HP)				34.5		87-27-60	
		1.0 **FAT CLAY (CH)**, gray, medium stiff to very stiff, with ferrous nodules and slickensides				1.5 (HP)							
		- gray and tan 4 to 6 feet - with calcareous nodules 4 to 25 feet	5			1.5 (HP)							
		- tan and light gray 6 to 25 feet				1.5 (HP)	UC	0.70	2.8	36.6	83	90-32-58	
						2.0 (HP)							
3			10			2.0 (HP)							
						2.5 (HP)	UC	1.22	3.2	28.8	93		
			15										
						3.0 (HP)							
			20										
						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
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-07

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6767° Longitude: -95.2265° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
2		**FILL - FAT CLAY (CH)**, dark gray and tan, with ferrous nodules and crushed stone 1.0											
3		**FAT CLAY (CH)**, gray, stiff to very stiff, with ferrous nodules and slickensides				2.5 (HP)				33.9		65-21-44	
						2.0 (HP)				32.9			
		5.0				3.5 (HP)							
		Boring Terminated at 5 Feet	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-08

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6782° Longitude: -95.2272° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
3		**FAT CLAY (CH)**, gray, medium stiff to stiff, with ferrous nodules and slickensides				1.0 (HP)	UC	0.54	6.2	11.4	106	58-18-40	
						1.0 (HP)							
		- gray and tan 4 to 5 feet				1.5 (HP)				34.0			
		5.0 ***Boring Terminated at 5 Feet***	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-09

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6780° Longitude: -95.2261° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
3		**FAT CLAY (CH)**, gray, medium stiff to stiff, with ferrous nodules and slickensides				1.0 (HP)				36.7		89-22-67	
		- gray and tan 2 to 4 feet				1.5 (HP)				35.0			
		- tan and light gray, with calcareous nodules 4 to 5 feet 5.0				1.0 (HP)							
		Boring Terminated at 5 Feet	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-10

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6776° Longitude: -95.2258° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
3		**FAT CLAY (CH)**, gray, medium stiff to stiff, with ferrous nodules and slickensides				1.0 (HP)	UC	0.87	3.5	24.8	92	83-22-61	
						1.5 (HP)							
		- gray and tan, with calcareous nodules 4 to 5 feet 5.0	5			2.0 (HP)				37.8			
		Boring Terminated at 5 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

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-11

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6773° Longitude: -95.2261° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
2		**FILL - FAT CLAY (CH)**, tan and light gray, with ferrous and calcareous nodules 2.0				1.0 (HP)	UC	0.66	6.8	30.5	90	76-23-53	
3		**FAT CLAY (CH)**, gray, stiff, with ferrous nodules and slickensides				1.0 (HP)				36.4			
		- gray and tan, with calcareous nodules 4 to 5 feet 5.0				1.0 (HP)							
		Boring Terminated at 5 Feet	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

Terracon
551 W League City Pkwy Ste F
League City, TX

Boring Log No. B-12

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 29.6770° Longitude: -95.2261° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
2		**FILL - FAT CLAY (CH)**, tan and light gray, with ferrous nodules 1.0											
3		**FAT CLAY (CH)**, gray, stiff, with ferrous nodules and slickensides				1.5 (HP)				30.6		67-23-44	
						1.5 (HP)							
		5.0				1.5 (HP)				39.7			
		Boring Terminated at 5 Feet	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed

Notes

Advancement Method
Dry augered to termination depth.

Abandonment Method
Boring backfilled with soil cuttings upon completion.

Drill Rig
Truck

Hammer Type
Automatic

Driller
Herman

Logged by
T.Roth

Boring Started
02-20-2024

Boring Completed
02-20-2024

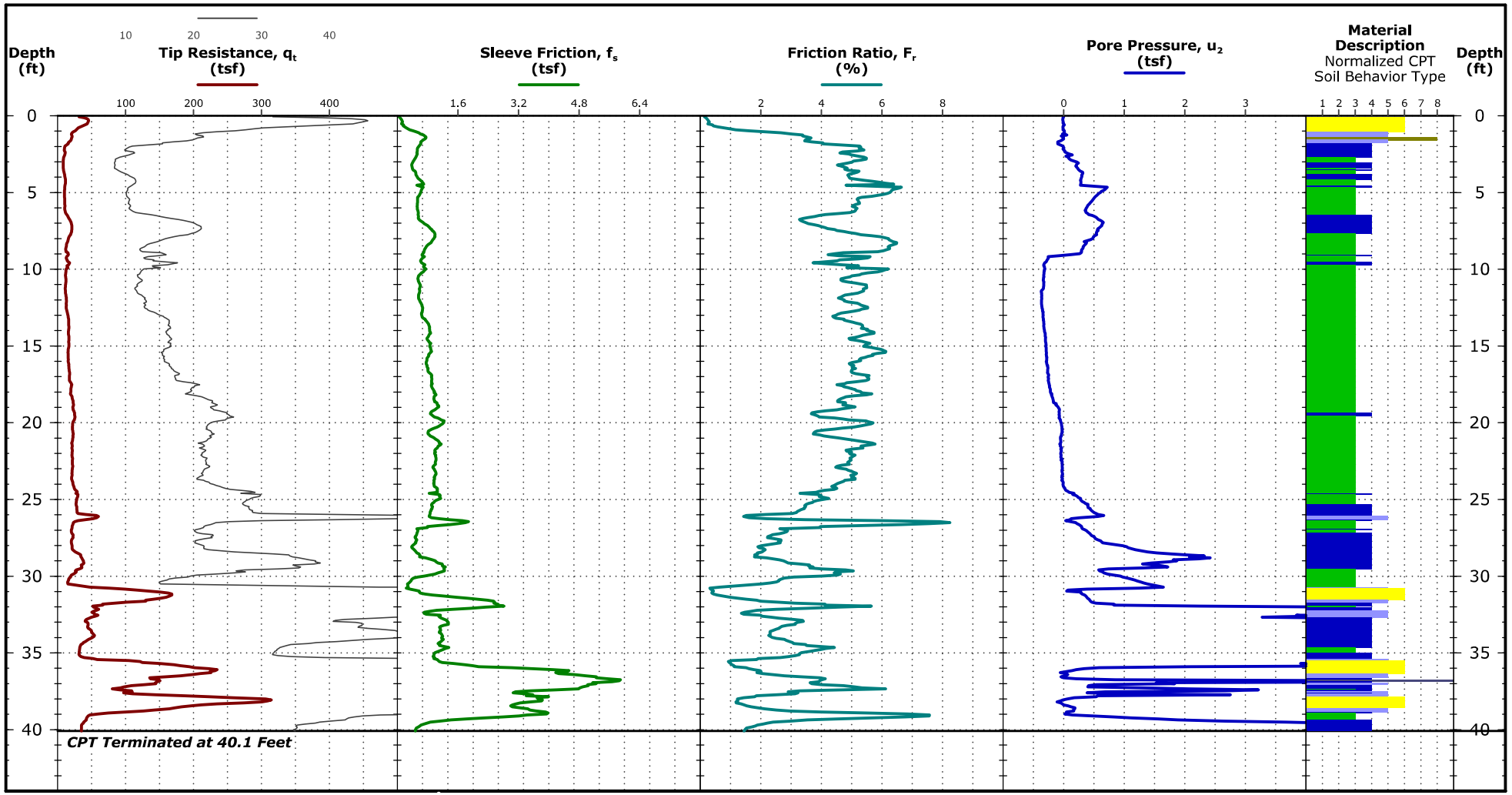
Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

CPT Sounding ID CPT-01

Latitude: 29.677453° Longitude: -95.226631°

Terracon
551 W League City Pkwy Ste F
League City, TX

CPT Started: 3/13/2024
CPT Completed: 3/13/2024



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: #521
Operator: R. Bauer
Auger anchors used as reaction force
CPT sensor calibration reports available upon request
Probe No. 5250 with net area ratio of .85
U_2 pore pressure transducer location
Manufactured by Nova Cone
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer

Water Level Observation

Normalized Soil Behavior Type (Robertson 1990)

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

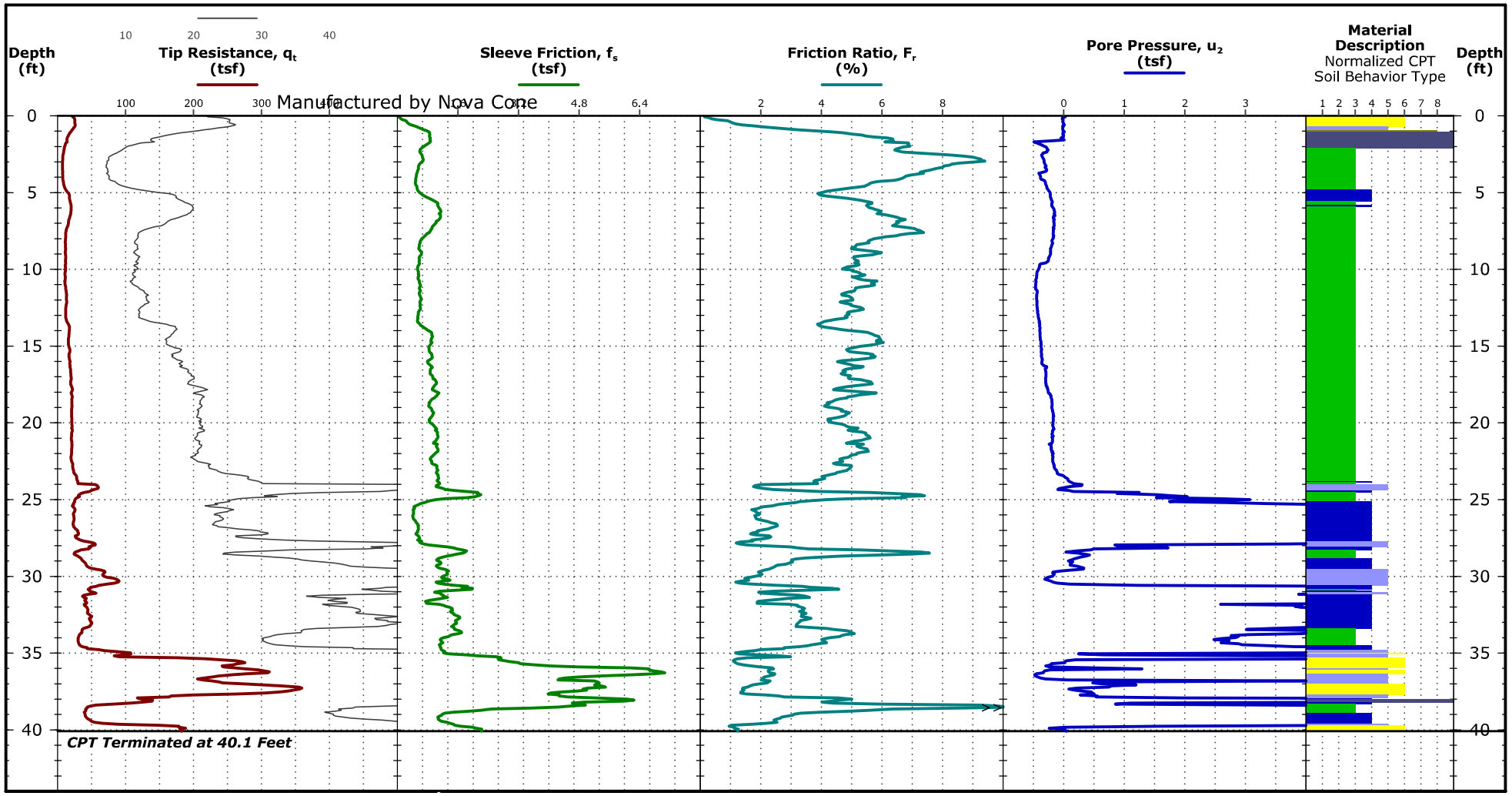
Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

CPT Sounding ID CPT-02

Latitude: 29.677322° Longitude: -95.226409°

Terracon
551 W League City Pkwy Ste F
League City, TX

CPT Started: 3/13/2024
CPT Completed: 3/13/2024



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: #521
Operator: R. Bauer
Auger anchors used as reaction force
CPT sensor calibration reports available upon request
Probe No. 5250 with net area ratio of .85
U_2 pore pressure transducer location
Manufactured by Nova Cone
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer

Water Level Observation

Normalized Soil Behavior Type
(Robertson 1990)

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

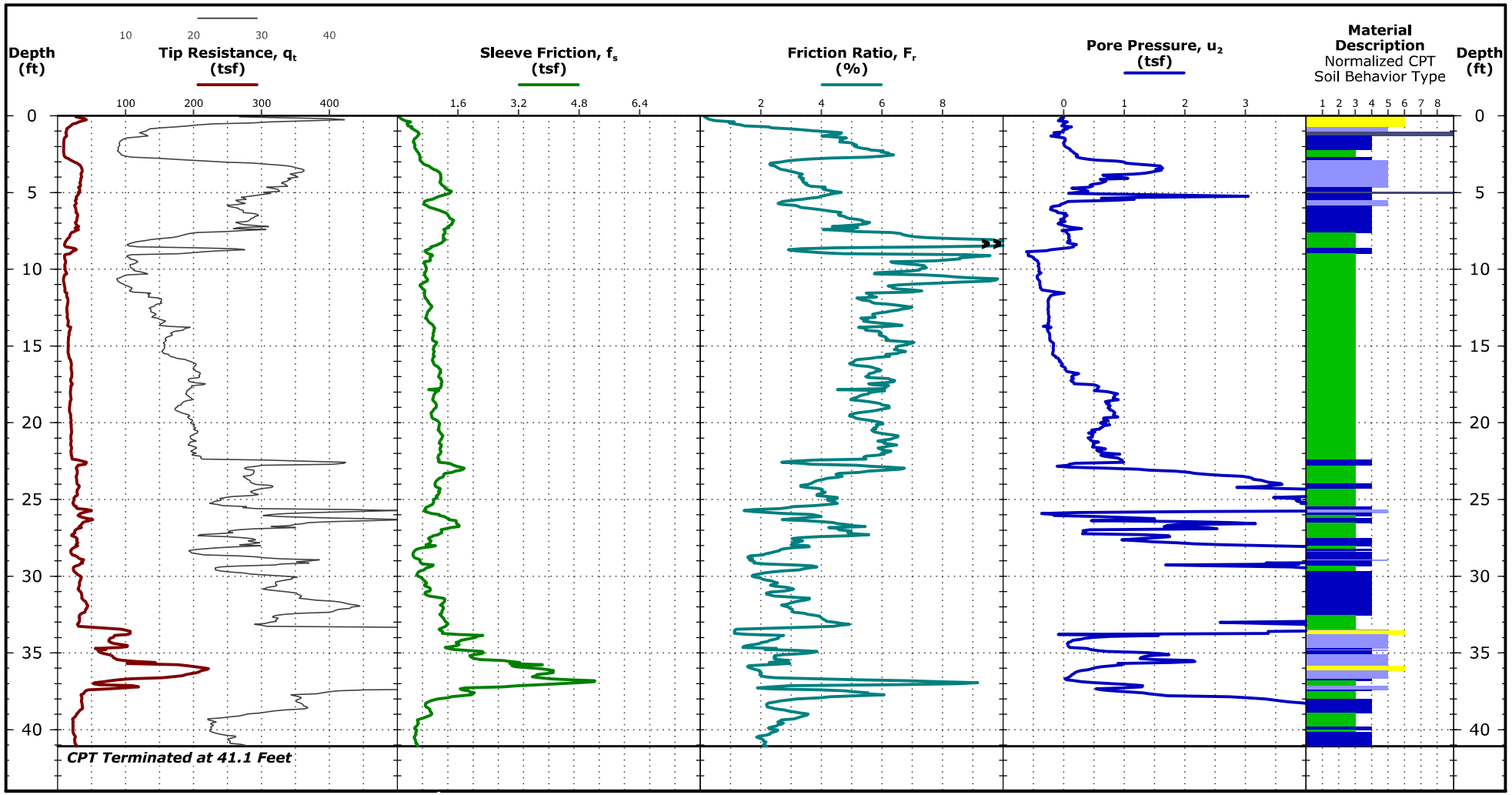
Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

CPT Sounding ID CPT-03

Latitude: 29.677679° Longitude: -95.226319°

Terracon
551 W League City Pkwy Ste F
League City, TX

CPT Started: 3/13/2024
CPT Completed: 3/13/2024



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: #521
Operator: R. Bauer
Auger anchors used as reaction force
CPT sensor calibration reports available upon request
Probe No. 5250 with net area ratio of .85
U_2 pore pressure transducer location
Manufactured by Nova Cone
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer

Water Level Observation

Normalized Soil Behavior Type
(Robertson 1990)

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

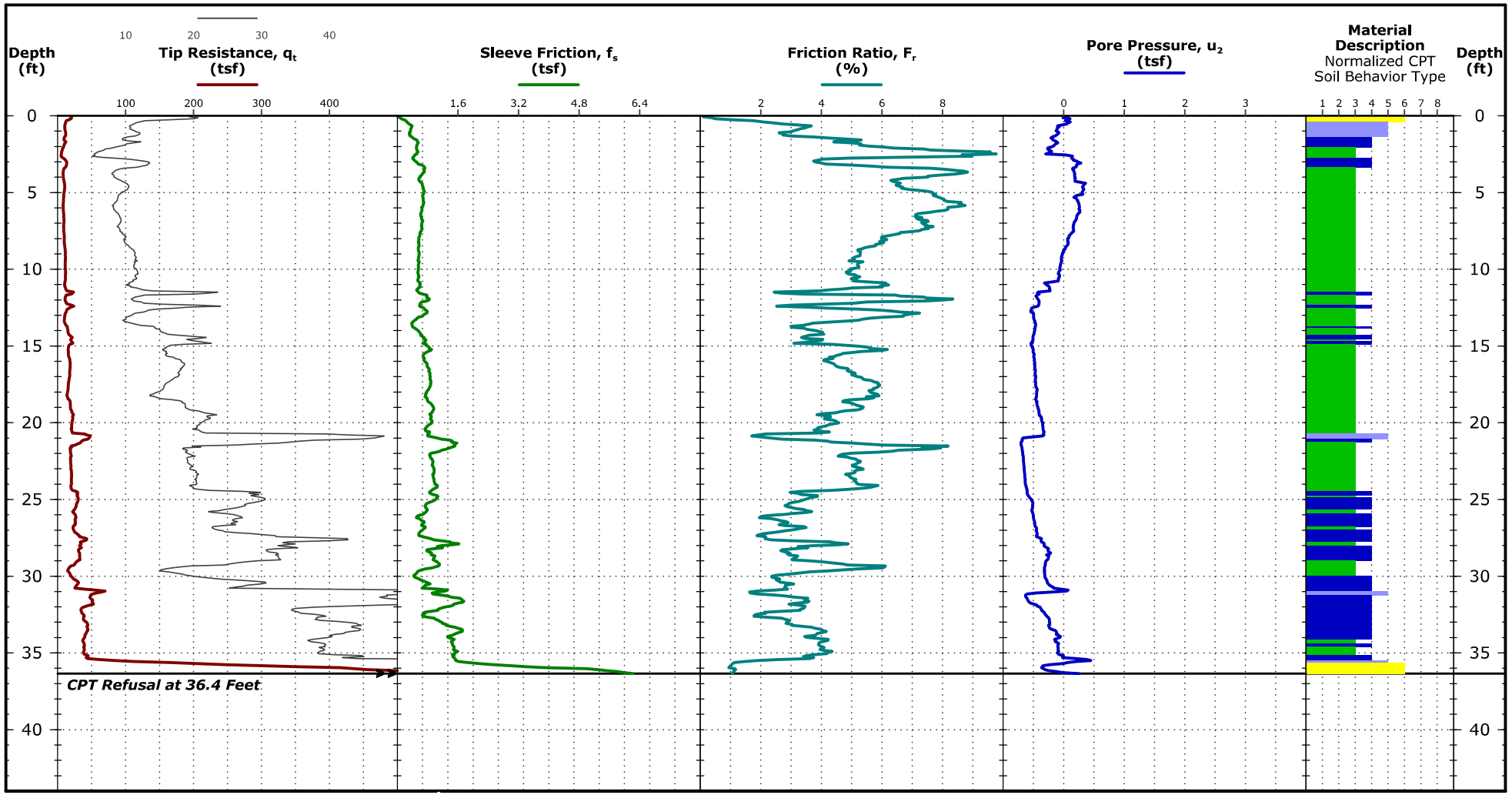
Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

CPT Sounding ID CPT-04

Latitude: 29.677330° Longitude: -95.227169°

Terracon
551 W League City Pkwy Ste F
League City, TX

CPT Started: 3/13/2024
CPT Completed: 3/13/2024



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: #521
Operator: R. Bauer
Auger anchors used as reaction force
CPT sensor calibration reports available upon request
Probe No. 5250 with net area ratio of .85
U_2 pore pressure transducer location
Manufactured by Nova Cone
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer

Water Level Observation

Normalized Soil Behavior Type
(Robertson 1990)

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

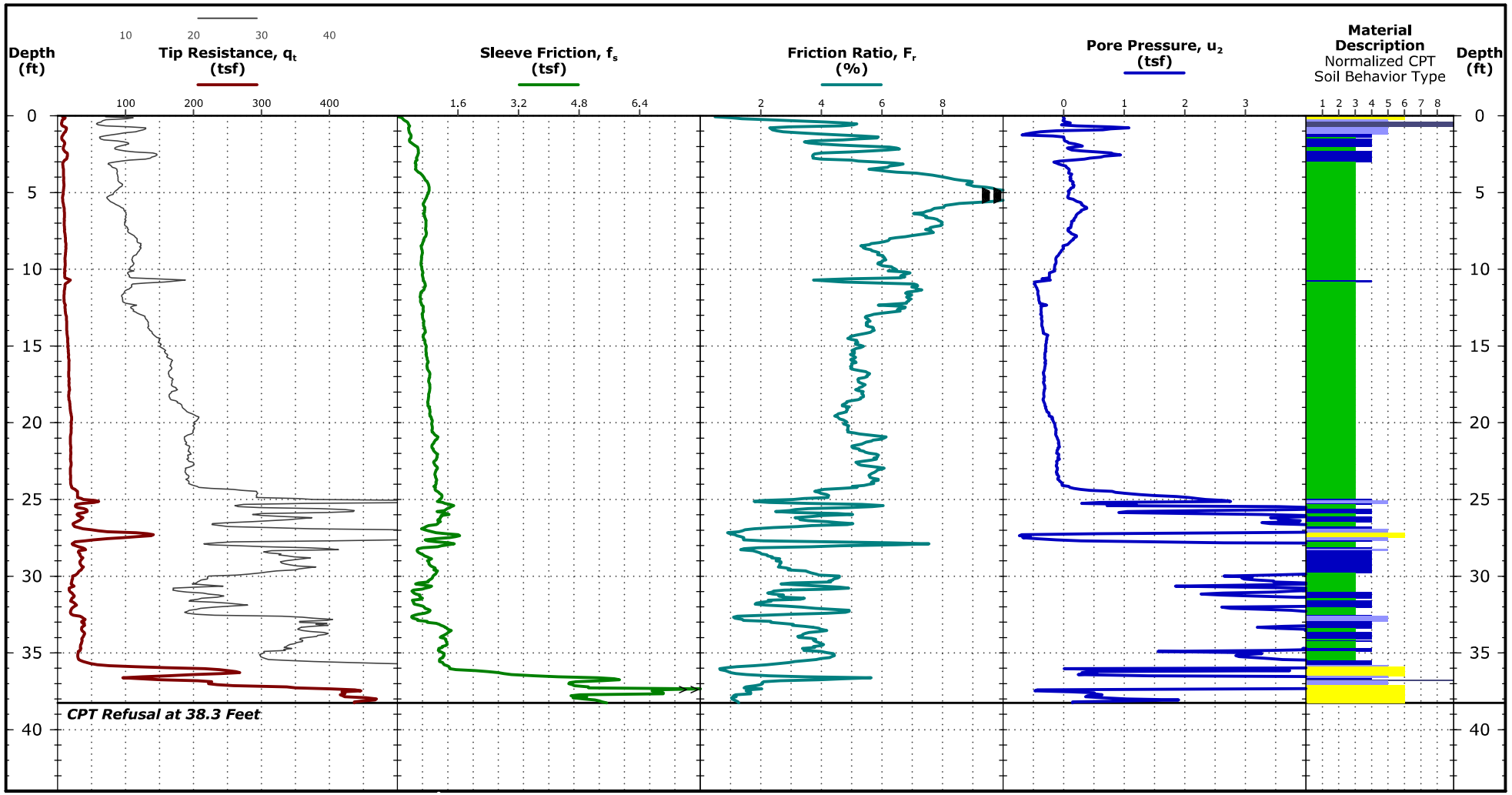
Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

CPT Sounding ID CPT-05

Latitude: 29.676983° Longitude: -95.227261°

Terracon
551 W League City Pkwy Ste F
League City, TX

CPT Started: 3/13/2024
CPT Completed: 3/13/2024



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: #521
Operator: R. Bauer
Auger anchors used as reaction force
CPT sensor calibration reports available upon request
Probe No. 5250 with net area ratio of .85
U_2 pore pressure transducer location
Manufactured by Nova Cone
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer

Water Level Observation

Normalized Soil Behavior Type
(Robertson 1990)

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

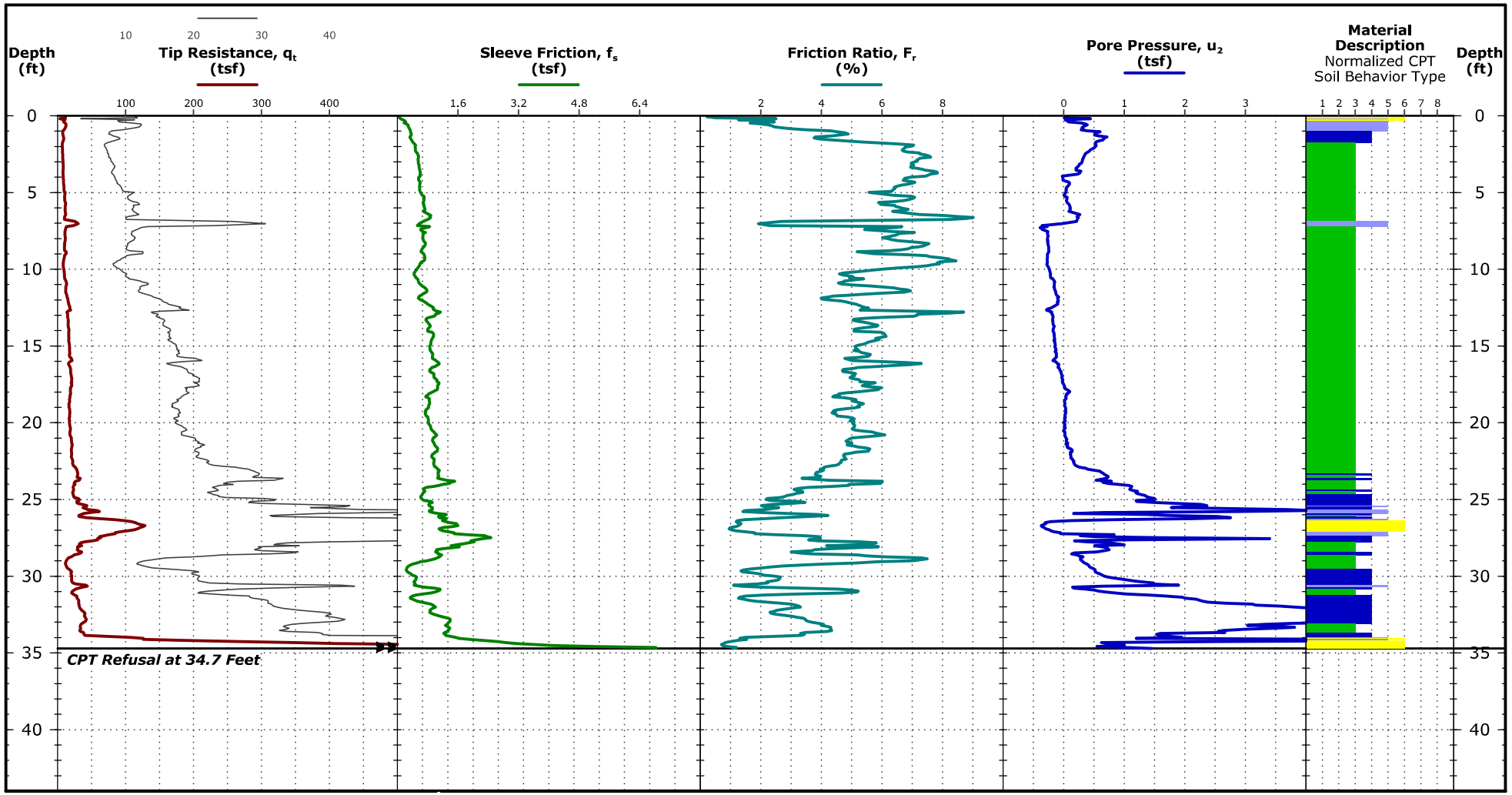
Williams Elementary School Replacement
1452 Queens Street | Houston, Texas
Terracon Project No. 91235141

CPT Sounding ID CPT-06

Latitude: 29.676940° Longitude: -95.226848°

Terracon
551 W League City Pkwy Ste F
League City, TX

CPT Started: 3/13/2024
CPT Completed: 3/13/2024



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.

Notes

Test Location: See Exploration Plan

CPT Equipment

CPT Rig: #521
Operator: R. Bauer
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Normalized Soil Behavior Type
(Robertson 1990)

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3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

Supporting Information

Contents:

Terracon
551 W League City Pkwy Ste F
League City, TX

General Notes

Sampling	Water Level	Field Tests
Auger Cuttings Shelby Tube	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils
(More than 50% retained on No. 200 sieve.)
Density determined by Standard Penetration Resistance

Relative Density	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 50
Very Dense	> 50

Consistency of Fine-Grained Soils
(50% or more passing the No. 200 sieve.)
Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance

Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Soft	less than 0.25	0 - 1
Soft	0.25 to 0.50	2 - 4
Medium Stiff	0.50 to 1.00	4 - 8
Stiff	1.00 to 2.00	8 - 15
Very Stiff	2.00 to 4.00	15 - 30
Hard	> 4.00	> 30

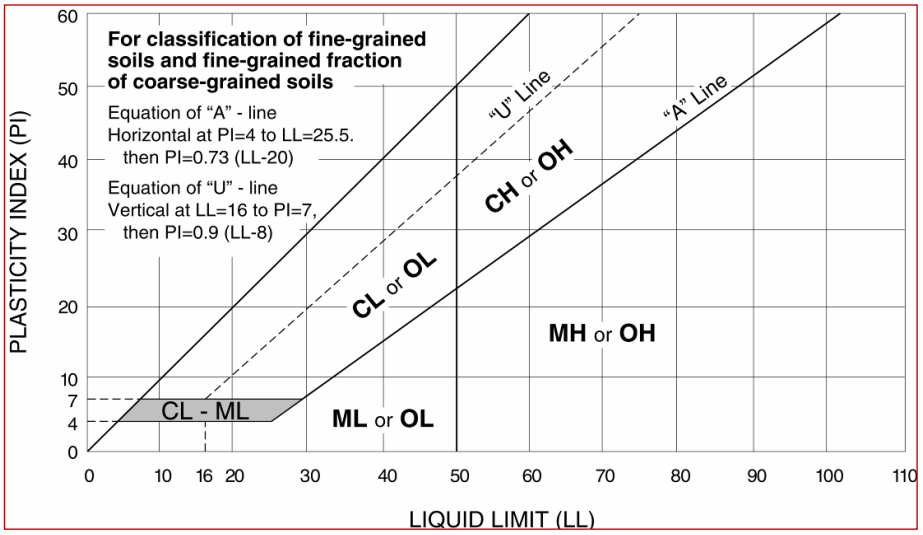
Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



CPT GENERAL NOTES

DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance, q_c
Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance, q_t
Cone resistance corrected for porewater and net area ratio effects
$q_t = q_c + u_2(1 - a)$

Where a is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

Pore Pressure, u
Pore pressure measured during penetration
u_1 - sensor on the face of the cone
u_2 - sensor on the shoulder (more common)

Sleeve Friction, f_s
Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio, F_r
The ratio as a percentage of f_s to q_t, accounting for overburden pressure

To be reported per ASTM D7400, if collected:

Shear Wave Velocity, V_s
Measured in a Seismic CPT and provides direct measure of soil stiffness

DESCRIPTION OF GEOTECHNICAL CORRELATIONS

Normalized Tip Resistance, Q_{tn}
$Q_{tn} = ((q_t - \sigma_{v0})/P_a)(P_a/\sigma'_{v0})^n$
$n = 0.381(I_c) + 0.05(\sigma'_{v0}/P_a) - 0.15$

Over Consolidation Ratio, OCR
$OCR\ (1) = 0.25(Q_{tn})^{1.25}$
$OCR\ (2) = 0.33(Q_{tn})$

Undrained Shear Strength, S_u
$S_u = Q_{tn} \times \sigma'_{v0}/N_{kt}$
N_{kt} is a soil-specific factor (shown on S_u plot)

Sensitivity, S_t
$S_t = (q_t - \sigma_{v0}/N_{kt}) \times (1/f_s)$

Effective Friction Angle, ϕ'
$\phi'\ (1) = \tan^{-1}(0.373[\log(q_t/\sigma'_{v0}) + 0.29])$
$\phi'\ (2) = 17.6 + 11[\log(Q_{tn})]$

Unit Weight, γ
$\gamma = (0.27[\log(F_r)]+0.36[\log(q_t/atm)]+1.236) \times \gamma_{water}$
σ_{v0} is taken as the incremental sum of the unit weights

Small Strain Shear Modulus, G_0
$G_0\ (1) = \rho V_s^2$
$G_0\ (2) = 0.015 \times 10^{(0.55Ic + 1.68)}(q_t - \sigma_{v0})$

Soil Behavior Type Index, I_c
$I_c = [(3.47 - \log(Q_{tn}))^2 + (\log(F_r) + 1.22)^2]^{0.5}$

SPT N_{60}
$N_{60} = (q_t/atm) / 10^{(1.1268 - 0.2817Ic)}$

Elastic Modulus, E_s (assumes $q/q_{ultimate} \sim 0.3$, i.e. FS = 3)
$E_s\ (1) = 2.6\psi G_0$ where $\psi = 0.56 - 0.33\log Q_{tn,clean\ sand}$
$E_s\ (2) = G_0$
$E_s\ (3) = 0.015 \times 10^{(0.55Ic + 1.68)}(q_t - \sigma_{v0})$
$E_s\ (4) = 2.5q_t$

Constrained Modulus, M
$M = \alpha_M(q_t - \sigma_{v0})$
For $I_c > 2.2$ (fine-grained soils)
$\alpha_M = Q_{tn}$ with maximum of 14
For $I_c < 2.2$ (coarse-grained soils)
$\alpha_M = 0.0188 \times 10^{(0.55Ic + 1.68)}$

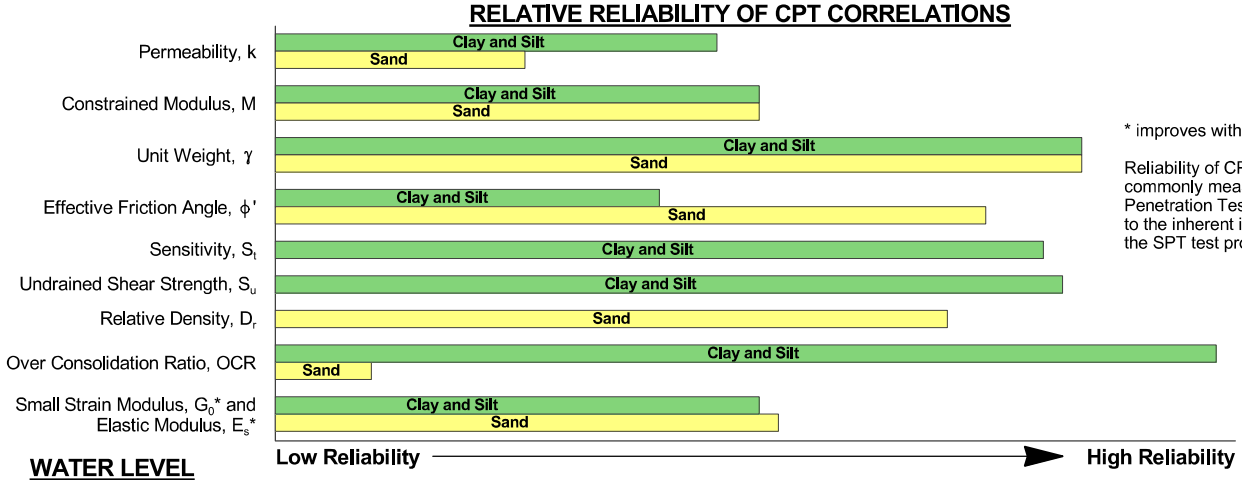
Hydraulic Conductivity, k
For $1.0 < I_c < 3.27$ $k = 10^{(0.952 - 3.04Ic)}$
For $3.27 < I_c < 4.0$ $k = 10^{(-4.52 - 1.37Ic)}$

Relative Density, D_r
$D_r = (Q_{tn} / 350)^{0.5} \times 100$

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include q_t, f_s, and u. Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. To this end, more than one correlation to a given parameter may be provided. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS



* improves with seismic V_s measurements

Reliability of CPT-predicted N_{60} values as commonly measured by the Standard Penetration Test (SPT) is not provided due to the inherent inaccuracy associated with the SPT test procedure.

WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

Measured - Depth to water directly measured in the field

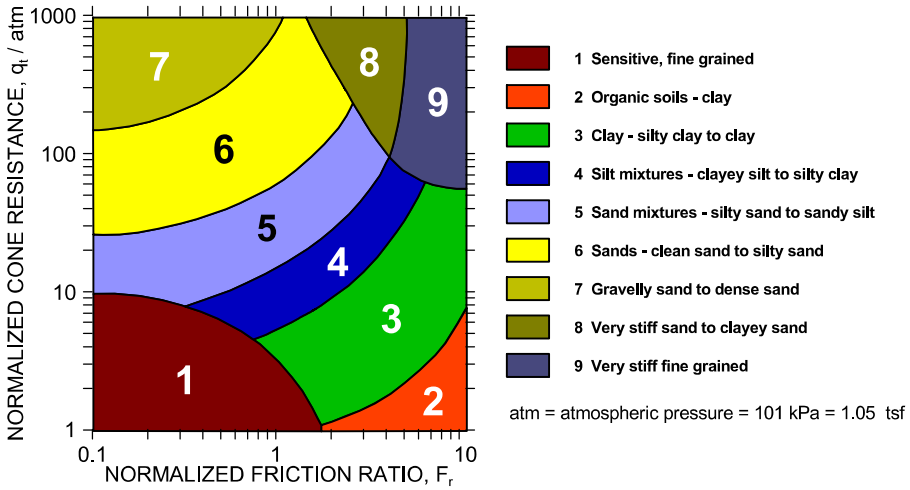
Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance (q_t), friction resistance (f_s), and porewater pressure (u_2). The normalized friction ratio (F_r) is used to classify the soil behavior type.

Typically, silts and clays have high F_r values and generate large excess penetration porewater pressures; sands have lower F_r's and do not generate excess penetration porewater pressures. The adjacent graph (Robertson *et al.*) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



atm = atmospheric pressure = 101 kPa = 1.05 tsf

REFERENCES

Kulhawy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.

Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institue of Technology, Atlanta, GA.

Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.

Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

Terracon

Exhibit: C-1

SECTION 02 41 13.10
REMOVING EXISTING PAVEMENTS, UTILITIES AND STRUCTURES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Removing concrete paving, asphaltic concrete pavement, and base courses.

B. Removing concrete curbs, concrete curbs and gutters, sidewalks, and driveways.

C. Removing pipe culverts, sewers and water lines.

D. Removing existing inlets and manholes.

E. Removing miscellaneous structures of concrete or masonry.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

B. Include cost of installing suitable backfill material and proper compaction (95% of the Std. Proctor Density) in cost of each item to be removed. No separate pay for this item.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate removal work with utility companies.

PART 2 P R O D U C T S – Not Used

PART 3 E X E C U T I O N

3.1 PREPARATION

A. Obtain advance approval from Engineer for dimensions and limits of removal work.

B. Identify known utilities below grade. Stake and flag locations.

3.2 PROTECTION

A. Protect the following from damage or displacement:
   1. Adjacent public and private property.
   2. Trees, plants, and other landscape features designated to remain.
   3. Utilities designated to remain.
   4. Pavement and utility structures designated to remain.
   5. Bench marks, monuments, and existing structures designated to remain.

3.3 REMOVALS

A. Remove pavements and structures by methods that will not damage underground utilities. Do not use a drop hammer near existing underground utilities.

B. Minimize amount of earth loaded during removal operations.

C. Where existing pavement is to remain, make straight saw cuts in existing pavement to provide clean breaks prior to removal. Do not break concrete pavement or base with drop hammer unless concrete or base has been saw cut to a minimum depth of two (2) inches.

D. Where street and driveway saw cut locations coincide or fall within three (3) feet of existing construction or expansion joints, break out to existing joint.

E. Remove sidewalks and curbs to nearest existing dummy, expansion, or construction joint.

F. Where existing end of pipe culvert or end of sewer is to remain, install an 8-inch thick masonry plug in pipe end prior to backfill.

G. When removing existing utilities or structures, all existing backfill material (i.e. cement stabilized sand) shall also be removed. Include in price of utility or structure removed.

3.4 BACKFILL

A. Backfill of removal areas shall be in accordance with requirements of Division 31.

B. Trench and structure excavations shall be backfilled in 8” lifts and compacted to 95% of the Std. Proctor Density. Reference Geotechnical Report and Plans for details on acceptable backfill.

3.5 DISPOSAL

A. Inlet frames, grates, plates, and manhole frames and covers may remain property of the Owner. Disposal shall be in accordance with requirements of Division 1.

B. Remove from the site debris resulting from work under this section in accordance with requirements of Division 1.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Complete all demolition work as shown on the Drawings, specified herein and required for the proper installation and interface of new Work.
   02 The Drawings depict general demolition requirements based on existing drawings and limited field observations; but are not exhaustive.
   03 Contractor shall visit the site and examine the existing conditions. Note all conditions as to character and extent of work involved.
   04 Contractor performing this work shall include in the proposal what is necessary to provide required demolition based on experience and industry standards.

C. Related Work:
   01 Section 01 36 13 – Cutting and Patching
   02 Section 31 23 33 – Trenching and Backfilling
   03 Section 32 12 16 – Asphaltic Paving
   04 Section 32 13 13 – Concrete Paving and Flatwork

1.2 PERMITS AND ORDINANCES

A. Procure and pay for all necessary permits or certificates required to complete the Work specified. Make any and all required notifications and comply with all applicable Federal, State and Local ordinances.

B. Strictly adhere to all governing authorities' ordinances for proper disposal of all materials removed from the site.

PART 2 – MATERIALS

2.1 GENERAL

A. Materials and equipment used for demolition work section shall be in accordance with industry standards and specifically suited for the task at hand.

B. Where existing buildings are indicated to be removed, the Contractor shall remove the entire building; including but not limited to utilities, subgrade foundations to a minimum depth of six feet (6'-0"), and adjacent flatwork.

C. Where partial existing work is removed, and the remaining portion is designed to interface with new work, carefully cut or otherwise remove existing work as required for proper fit and finish to subsequent new work.

D. All existing concrete to be removed shall be saw-cut as required to provide a smooth, vertical edge to tie into new adjacent concrete.

E. All existing masonry to be removed shall be saw-cut as required to provide a smooth, vertical edge to tie into new adjacent masonry or other work as indicated on the Drawings.

F. All abandoned water and sewer lines shall be removed back to a concealed location and capped.
   01 At Slab Conditions: below slab. Cut and patch as required.
   02 At Drywall Partitions: behind gyp board panel. Cut and patch as required.
   03 At CMU Walls: behind CMU or back to CMU cavity where pipe runs in cavity. Cut and patch as required.
   04 At Ceiling Conditions: to above finished ceiling panel. Cut and patch as required.

G. Field verify existing conditions and coordinate with other trades as required to include the full scope of work required.

PART 3 - EXECUTION

3.1 PROTECTIONS

A. Prior to start of demolition work, Contractor shall provide Architect with comprehensive video documentation of existing work within and adjacent to the areas of demolition.
   01 Such documentation shall be used to evaluate existing work to remain to determine if any consequential / collateral damage has occurred as a result of demolition activities.
   02 Contractor shall make all necessary repairs and / or replacements at such damage as required to restore to original condition.

B. Execute all demolition work in an orderly and careful manner with due consideration for any existing structures, including any part of the surrounding areas which are to remain.
   01 Barricade and cover as necessary to protect work to remain and adjacent areas.
   02 Protect any existing active service lines, indicated or not.
   03 Provide adequate protective covering to assure that no damage occurs to existing areas / work to remain.

C. Avoid any encroachment on adjacent properties and Right-Of-Ways. Repair and make good any damage to adjoining properties or improvements caused by operations, including any damage or loss to adjoining materials.

D. Keep all pedestrian areas clear for passage at all times.

E. Conduct operations so as not to interfere with adjacent roads, streets, drives, walks, service lines and the like.

3.2 GENERAL

A. Coordinate with other trades as required to confirm extent of demolition to be performed.
   01 Where over-demolition occurs, or work is removed that should have remained, make all necessary repairs and / or replacements required to restore existing work.

B. Backfill any trenches caused by demolition work. Refer to Section 31 23 33 – Trenching and Backfilling.

C. Salvage of Removed Material:
   01 The Owner reserves the right to claim all material / equipment removed under this Contract.
   02 Prior to the start of demolition work, the Contractor shall contact the Owner to determine what, if any, materials and / or equipment removed are to be salvaged for Owner's retention.

D. Disposition of Removed Material: All material removed under this Contract, which is not to be salvaged or reused, shall become the property of the Contractor and be promptly removed from the site. Do not store or permit debris to accumulate on the site.

E. The Contractor shall review the Contract Documents as they relate to selective demolition. Items that will interfere with new work shall be removed as required to coordinate with the new work.

F. Clean-Up: On completion of demolition work, leave property and adjacent areas clean and satisfactory to local authorities and the Architect.

3.3 EXECUTION

A. All partial demolition at existing concrete work shall be performed by saw-cutting or removal back to a full-depth concrete joint; as required to provide a clean interface with new concrete tying into existing concrete work to remain.

B. At areas of partial demolition, where remaining existing work is to tie into new work, conduct demolition as required to provide proper interface between existing work to remain and new work.

C. Where existing work is shown to be removed and re-used (i.e. masonry), carefully remove such work and preserve in a condition suitable for reinstallation.

END OF SECTION

SECTION 03 15 19

BELOW SLAB VAPOR MEMBRANES
SLAB ON GRADE FOUNDATIONS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all vapor retarder membranes, vapor barrier membranes and related accessories as required in forming a complete, 100% sealed membrane below building foundations.
   02 Coordinate Work with other trades to seal all penetrations through the slab membrane.

C. Related Work:
   01 Section 01 45 23 – Testing and Inspection Services
   02 Section 03 30 00 – Cast-In-Place Concrete
   03 Section 07 17 16 – Bentonite Composite Sheet Waterproofing

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.
   03 Installation shall be in strict accordance with ASTM E1643.
   04 Provide details to be used to seal the perimeter of the vapor barriers to the foundation per ASTM E1642-11.
   05 Provide details to be used to seal other trade work that penetrates the slab membrane.
   06 Provide details to be used to seal penetrations made by temporary form stakes.

E. Tests and Certifications:
   01 Summary of test results per paragraph 9.3 of ASTM E1745.
   02 All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.
   03 Upon completion of slab membrane installation and foundation preparation immediately prior to placement of concrete, manufacturer's rep shall inspect membrane installation and provide certification that installation is complete, and in accordance with specified requirements.

F. Actual Samples of Proposed Materials:
   01 Vapor retarder membrane, 8" x 10" minimum size.
   02 Vapor barrier membrane, 8" x 10" minimum size.
   03 Membrane perimeter grade beam sealing device(s).
   04 Joint / seam tape, 12" minimum length.
   05 Pre-formed penetration boot (each type).

1.3 REFERENCES

A. American Concrete Institute (ACI):
   01 Detailing Manual.
   02 ACI 302.2R-06 – Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

B. U.S. Federal Specifications:
   01 Fed. Spec. SS-S-158.
   02 Fed. Spec. SS-S-164.

C. American Society for Testing and Materials (ASTM):
   01 ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   02 ASTM D1709 – Standard Test Methods for Impact Resistance of Plastic Film by the Free Falling Dart Method.
   03 ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   04 ASTM E1643 – Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
   05 ASTM E1745 Class A – Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

1.4 SITE CONDITIONS

A. Do not proceed with membrane installation until all subgrade testing is complete and found to be in compliance with specified requirements.

B. Subgrade Conditions:
   01 Inspect subgrade conditions as required to confirm adequacy for installation of slab membrane work in accordance with manufacturer's standards and specified requirements.
   02 Verify that under-slab work of other trades is complete and does not present any conditions that may prevent the proper installation of slab membrane work in accordance with manufacturer's standards and specified requirements; or create a potential for breaching the membrane after it is installed.
   03 Notify Contractor of any discrepancies, deficiencies and / or issues. Do not proceed until fully resolved.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – VAPOR RETARDER MEMBRANES

A. Under Slab Vapor Retarder Membrane: Design is based on products / systems manufactured by Stego Industries.

B. Other acceptable manufacturers: the following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Reef Industries.
   02 Sundance, Inc.

2.2 MANUFACTURERS – VAPOR BARRIER MEMBRANES

A. Under Slab Vapor Barrier Membrane: Design is based on products / systems manufactured by Stego Industries.

B. Other acceptable manufacturers: the following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Reef Industries.
   02 Sundance, Inc.

2.3 VAPOR RETARDER BELOW-SLAB MEMBRANES

A. Design of Vapor Retarder Membrane is based on Stego Industries 15 mil Stego Wrap Vapor Barrier membrane.
   01 Provide all materials and accessories as specified and recommended by the manufacturer for a complete under slab membrane system.

B. Provide vapor retarder membrane below all building slabs / foundations except areas described below to receive vapor barrier membrane.

C. Under Slab Vapor Retarder Membrane:
   01 Material: manufactured from a blend of the highest quality polyolefin resins.
   02 Vapor Retarder / Slab Membrane shall be a manufacturer's complete system including but not limited to membrane, joint tape, penetration boots, mastic / sealant, and other accessories as supplied by the manufacturer.
   03 High strength, flexible, polyolefin resin based, low-permeance, geo-membrane vapor retarder system.
   04 Meeting or exceeding all requirements of ASTM E1745, Class A.
   05 Thickness: 15 mils minimum; no exceptions.
   06 Water Vapor Permeance rating of less than 0.01 perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1.2 – 7.1.5.
   07 Puncture Resistance: Exceeds 2,300 grams per ASTM D1709 Method B.
   08 Tensile Strength: Exceeds 55 PSI per ASTM D882.

2.4 VAPOR BARRIER BELOW-SLAB MEMBRANES

A. Design of Vapor Barrier Membrane is based on Stego Industries 20 mil Stego Wrap Vapor Barrier membrane.
   01 Provide all materials and accessories as specified and recommended by the manufacturer for a complete under slab membrane system.

B. Provide vapor barrier membrane below all building slabs / foundations scheduled or shown to receive finish wood flooring systems; to include, but not necessarily limited to:
   01 Gymnasiums.

02 Dance Studios.
03 Theater Stage / Aprons.
04 Drama Rooms.

C. Under Slab Vapor Barrier Membrane:
01 Material: manufactured from a blend of the highest quality polyolefin resins.
02 Vapor Retarder / Slab Membrane shall be a manufacturer's complete system including but not limited to membrane, joint tape, penetration boots, mastic / sealant, and other accessories as supplied by the manufacturer.
03 High strength, flexible, polyolefin resin based, low-permeance, geo-membrane vapor retarder system.
04 Meeting or exceeding all requirements of ASTM E1745, Class A.
05 Thickness: 20 mils minimum; no exceptions.
06 Water Vapor Permeance rating of less than 0.01 perms as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1.2 – 7.1.5.
07 Puncture Resistance: Exceeds 3,500 grams per ASTM D1709 Method B.
08 Tensile Strength: Exceeds 97 PSI minimum per ASTM D882.

2.5 OTHER VAPOR MEMBRANES MATERIALS AND ACCESSORIES

A. Vapor Retarder Membrane Seam Tape and Perimeter Seal:
01 Design is based on Stego Industries "Crete Claw" seam tape with a heavily textured top that forms a mechanical bond to the wet concrete.
02 Width: minimum 6".
03 High density polyethylene tape with pressure sensitive adhesive specifically formulated for use with the polyolefin membrane.
04 Permeance: 0.03 maximum.
05 Thickness: shall be same as membrane or thicker.
06 In addition to application at membrane seams, apply tape on a maximum 10' x 10' grid throughout the membrane surface to assure consistent and complete attachment to the structural concrete foundation.

B. Membrane Penetrations:
01 All penetrations through the vapor barrier membrane shall be completely sealed.
02 Methodology shall be as recommended by the manufacturer.
03 Design is based on Stego Tape and Stego Mastic in accordance with manufacturer's standards and recommendations for the specific application.
04 Other methods (i.e. preformed boots) will be consider based on manufacturer's recommendations, subject to approval by the Architect.

C. System Requirements:
01 The vapor retarder membrane shall be a system specifically designed or suited to be applied to a structural concrete foundation where the slab is elevated above grade.
02 The vapor retarder system must adhere to the underside of the foundation and remain in place after deterioration of the cardboard carton forms used to form the structural slab.
03 Attachment to the structural foundation by any means that penetrate the vapor barrier membrane shall not be accepted.
04 The perimeter grade beams of the structural foundation shall bear on subgrade. The system shall extend to the outside face of the grade beams and be similarly permanently attached.

D. Accepted methods of membrane attachment to underside of structural foundation:
01 Use of a seam tape and / or seam tape grid that is capable of permanently bonding with the concrete at the time it is poured (basis of design).

02 Use of a membrane that has an integral fleece back designed to permanently bond with the concrete at the time it is poured.

PART 3 - EXECUTION

3.1 PREPARATION

A. Foundation Preparation: Verify the following is complete and acceptable prior to installation of under slab membranes:
   01 Foundation formwork.
   02 Underground work of other trades.
   03 All work that will penetrate the vapor membrane.

B. Verify the area to receive under slab membranes is free from other trade work, obstructions and / or foreign objects that may puncture the membrane after installation.
   01 Notify Contractor of any issues and / or concerns and do not proceed until satisfactorily resolved.

C. Drilled Piers / Plinths: Thoroughly clean concrete plinths and prepare for sealing under slab membrane to pier tops / plinths in accordance with membrane manufacturer's installation instructions.

D. Provide a means of sealing form stakes and other temporary penetrations through the under slab membrane.

E. VaporStakes® or other approved permanent stakes, sealed with mastic or seam tape at membrane penetration as recommended by the membrane manufacturer, and approved by the Architect.

F. Temporary form block-out that will allow patching membrane after the stake is removed; leaving room for patching and sealing membrane.

3.2 UNDER SLAB MEMBRANE INSTALLATION

A. Install membrane systems in strict accordance with manufacturer's recommendations and requirements, and in accordance with ASTM E1643.
   01 Installation shall provide a continuous, sealed membrane barrier beneath all building foundation area and below all grade beams through to the top of the exterior face.
   02 If / where membrane is interrupted (i.e. drilled footings, plinths, and similar), membrane shall be sealed to concrete surface per manufacturer's recommendations.
   03 Membrane shall extend through and up outside face of perimeter grade beams to finish grade line.
   04 Membrane shall be integrally and continuously attached to grade beam outside face per manufacturer's recommendations.

B. Install Vapor Retarder membrane system below all building foundations on properly compacted structural fill pad.

C. Lay out membrane in as full sheets as possible, minimizing the amount of joints / seams.

D. Lap joints / seams 6” minimum and seal continuously with membrane manufacturer’s system joint tape covering full laps in accordance with manufacturer’s instructions.
   01 Clean all debris, dirt and other contaminants from membrane surfaces to receive joint tape.

E. Penetrations by Other Trades:
   01 Work by other trades that penetrate membrane from subgrade to above slab shall be sealed 100% to ensure and maintain under slab barrier effectiveness.
   02 Provide manufacturer’s tape, mastic, preformed boots or accurately cut, site fabricated membrane boots per manufacturer’s instructions and recommendations.
   03 All penetration sealing assemblies shall above finish slab elevation a minimum of 6” and be sealed with seam tape and / or mastic to penetrating object.
   04 Where multiple penetrations occur in close proximity, use mastic to completely fill all voids and potential areas where water vapor could penetrate the assembly in strict accordance with manufacturer’s standards recommendations.

F. Temporary Form Penetrations:
   01 Where temporary forms are used to separate slab pours create slab recesses and other types of offsets, supporting stakes penetrations through the slab membrane shall be sealed 100%.
   02 Acceptable permanent stakes to remain in the slab are acceptable, provided they are sealed with mastic in accordance with manufacturer’s installation instructions. Wood stakes are not acceptable permanent stakes.
   03 Where temporary stakes are removed from the finished slab, provide an acceptable means by which the hole through the membrane can be patched and sealed with membrane, seam tape and / or mastic.
   04 Completely fill stake voids with concrete as soon as practical while slab concrete is still plastic.

G. Take all necessary precautions during concrete placement as required to prevent puncture of the under slab membrane.
   01 During concrete placement, continuously monitor / inspect the under slab membrane.
   02 Seal any / all membrane punctures before placement of concrete.

3.3 INSTALLATION CERTIFICATION

A. The vapor barrier membrane manufacturer shall provide the services of a qualified representative to provide the following services:
   01 Inspect the building foundation / slab prep to determine it is suitable for the membrane installation to commence.
   02 Inspect the membrane installation during installation to confirm all requirements, standards and recommendation are being strictly adhered to.
   03 Inspect the final foundation prep 24 hours prior to placement of concrete to verify that the vapor membrane system is correct.
   04 Be present during concrete placement to observe that all requirements regarding the vapor membrane system are being adhered to.

B. Correct all deficiencies noted by the inspector as required for his approval.

C. Provide a letter from the manufacturer certifying the installation is complete and acceptable to proceed with placement of concrete.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
01 Provide all concrete and concrete accessories required for a complete installation.
02 Building Foundation: Including drilled piers, grade beams, spread footings foundation walls, and / or slab on grade.
03 Steel structure supported slabs.
04 Site paving, curbs flatwork and sidewalks.
05 Foundations for site lights.
06 HVAC equipment support structures and housekeeping pads.
07 Coordinate with all other trades to confirm requirements and scope required for all associated work.

C. Related Work:
01 Section 01 22 00 – Unit Prices
02 Section 01 45 23 – Testing and Inspection Services
03 Section 03 15 19 – Below Slab Vapor Membrane
04 Section 03 52 16.19 – Lightweight Insulating Concrete
05 Section 07 13 53 – Elastomeric Sheet Waterproofing
06 Section 31 20 00 – Earth Moving
07 Section 31 32 13.19 – Lime Soil Stabilization
08 Section 32 13 13 – Concrete Paving and Flatwork
09 Section 32 13 16 – Decorative Concrete Paving

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Proposed mix designs for each different concrete mix proposed to be furnished, including adequate historical documentation of previous use to substantiate performance and strengths.

D. Tests and Certifications:
01 Before starting any work under this Section, make all required arrangements with the testing agency. The testing laboratory shall test and furnish certified reports on proposed cements, aggregates, mixing water and admixtures.
02 Submit proposed design mixes for each type of concrete using previously tested and approved materials.
03 Furnish certified reports of each proposed mix for each type of concrete.

04 Proportion mixes by laboratory trial batch or field experience methods, using materials to be employed in the work for each class of concrete required, and report to the Architect.
05 Refer to Section 01 45 23 – Testing and Inspection Services for on-site procedures and testing requirements.
06 Furnish ready mix delivery tickets.

E. Shop Drawings:
01 Shop Drawings for all reinforcing steel. Show bending diagrams, splicing and laps of rods, shapes, dimension and details of bar reinforcement and accessories.
02 Shop Drawings showing location of all proposed formwork construction and control joints, keying / keyways, water stops, openings, depressions, trenches, sleeves, inserts, and other items affecting reinforcement and placement of concrete.
03 Placement sequence schedule may be combined with Item 02.
04 Unless shown on the Site Plan, submit proposed layout for all expansion joints in paving, flatwork and sidewalks.

F. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
02 Generic details that do not depict actual conditions shall not be acceptable.

G. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
01 Include recommended cleaning products and instructions for use.
02 Where applicable, provide recommended maintenance schedules and procedures.

H. Color / Finish Samples for Colored Concrete:
01 Provide two (2) samples of each finish for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3" x 3", but must be large enough to convey attributes of the proposed product.

I. Actual Samples of Proposed Materials: Provide two (2) actual samples of the following products proposed to be furnished.
01 Plastic rebar chair supports.
02 Water stops.
03 Stains: full range of manufacturer's available color selections.

1.3 REFERENCES

A. American Concrete Institute:
01 Detailing Manual.
02 ACI 301 – Specifications for Structural Concrete.

B. U.S. Federal Specifications:
01 Fed. Spec. SS-S-158
02 Fed. Spec. SS-S-164

C. American Society for Testing and Materials:
   01 ASTM A1064 – Welded Steel Wire Fabric for Concrete Reinforcement.
   02 ASTM A615 – Steel Bars for Concrete Reinforcement.
   03 ASTM A704 – Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
   04 ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   05 ASTM C33-379 – Standard Specifications for Concrete Aggregates.
   06 ASTM C94 – Standard Specifications Ready Mix Concrete.
   07 ASTM C150 – Standard Specifications for Portland Cement.
   08 ASTM C260 – Specifications for Air Entraining Admixtures for Concrete.
   09 ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   10 ASTM C494 – Standard Specifications for Chemical Admixtures for Concrete.
   11 ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete
   12 ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

D. American Association of State Highway and Transportation Officials (AASHTO):
   01 AASHTO M-213-74 – Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
   02 AASHTO M-148 – Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

E. Portland Cement Association: Joint Design for Concrete Highway and Street Pavement, Concrete-Typical Pavement Sections and Jointing Details.

1.4 SITE CONDITIONS

A. Environmental Conditions:
   01 Do not place concrete in contact with frozen earth.
   02 Do not commence concrete placement unless temperature is at least 35°F (2°C) and rising, or slabs until the temperature rises above 40°F.
   03 Discontinue concrete placement when air temperatures exceed 95°F.
   04 Do not place concrete during rain unless adequate protection is provided.

B. Subgrade Conditions:
   01 Inspect subgrade conditions as required to confirm adequacy for concrete work to proceed.
   02 Notify Contractor of any discrepancies, deficiencies and / or issues. Do not proceed until fully resolved.

C. Equipment and Manpower:
   01 Verify adequate equipment, in good working condition, is provided for all concrete pours.
   02 Verify adequate manpower is provided for concrete pours.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Joint Sealant:
   01 Pecora
   02 BASF / Sonneborn

03 Tremco
04 W.R. Meadows

B. Acceptable Manufacturers: Reinforcing Chairs:
01 Dayton Aztec Castle Chairs
02 OCM, Inc.
03 No other substitutions.

C. Acceptable Manufacturers: Water-stops (also refer to Structural Drawings):
01 Durajoint – Seal-Tite
02 Henry Company – Synko-Flex
03 Vinylex Corporation – Blue Stop

D. Acceptable Manufacturers: Curing Compound:
01 Nox-Crete-Cure & Seal 100-300 E
02 Shepler's – Shep-Cure 309 Rez All
03 Sonneborn – Kure-N-Seal
04 W.R. Meadows – Vocomp-20

E. Acceptable Manufacturers: Concrete Color Pigment (Stain):
01 Bomanite
02 Davis Colors
03 L.M. Scofield
04 New Riverside Ochre Co., Inc.

2.2 CONCRETE MATERIALS

A. Concrete:
01 General:
a. Ready-mixed concrete, ASTM C94.
b. Comply with ACI 318.
c. Concrete must be approved by Architect through design mix and cylinder test of testing laboratory.
02 Cement: Type 1, ASTM C150, unless approved otherwise by the Architect. Use one brand of cement for entire project.
03 Aggregates:
a. Comply with ASTM C33. Aggregate shall be limestone at paving.
b. Maximum size not larger than one-fifth of the narrowest dimension between forms of the member for which concrete is to be used. Not larger than three-fourths of minimum clear spacing between reinforcing bars.
c. Maximum 1 ½ inches in building slabs.
04 Admixtures:
a. Approval necessary from Architect and testing laboratory.
b. Use of Calcium Chloride, accelerants, or additives shall not be permitted unless there is prior written approval by the Architect and Engineer of Record.
c. Color Pigment: At areas indicated on drawings provide pigment at 5 pounds per 94-pound sack of cement. Follow manufacturers' recommendations.
05 Strengths:
a. 5 sack/3000 psi/28 days: all concrete including grade beams, footings, slabs, pavements, walks.
b. Strength recommendations on Structural Drawings supersede when they are greater than specified here.

06 Water: Drinking quality.
07 Slump:
a. Reinforced foundation walls and footing – 5-1/2 inch max.
b. Slabs, beams, columns and reinforced walls – 6-inch max.
c. Pavement – 5-1/2 inch max.

B. Metal Reinforcing Bars:
01 General: Conform to ACI Publication 315, latest edition.
02 Comply with ASTM A615, Grade 60.
03 #3 bars comply with ASTM A615, Grade 40.

C. Joints:
01 Construction Joint - Building Slab:
02 Standard type permanent galvanized keyed contraction expansion joints, with 5 stakes per 10 feet of joint length.
03 Joint may be left in place when concrete is placed on each side simultaneously. Remove when mold as edge form prior to subsequent concrete placement.
04 Expansion Joint:
a. Fiber Joint Filler: ¾ inch thick, pre-molded asphalt impregnated rigid fiber board. Comply with AASHTO M-213-74 or redwood.
b. Cap sealant: Comply with Fed. Spec. TT-S-00227E “Two Component”, 100% Urethane (light grey).
05 Tooled Joint: Scored ¼” wide x ¼” the thickness of the concrete in depth.
06 Saw-Cut Joint: 1/8” wide x ¾” to 1” deep.

D. Waterstops – Flexible:
01 Design based on Henry Company SF302 Synko-Flex Waterstop; or accepted equal.
02 Asphalt based, non-hydrophilic / non-expanding waterstop.
03 Continuous, flexible, moldable strip with protective wrapping.
04 Size: 1” wide x ¾” deep.

E. Waterstops – Semi-Rigid:
01 Design based on BoMetals, Inc. PVC Waterstops; or accepted equal.
02 The PVC waterstop shall be extruded from an elastomeric plastic material, of which the basic resin is prime, virgin polyvinyl chloride.
03 The PVC compound shall not contain any scrapped or reclaimed material or pigments whatsoever.
04 Provide waterstops in the shapes (i.e. dumbbell, ribbed) as indicated on the Drawings.
05 Provide in sizes as required to achieve a minimum 2” embedment in each section of concrete.
06 Provide thermostatically controlled Teflon covered waterstop splicing irons for field splicing as provided by BoMetals, Inc.

F. Rebar Chairs and Spacers:
01 Aztec “Castle Chair”.
02 OCM, Inc. – “Plastic Cradle Chair”.
03 Heavy-duty plastic-type sized to support all slab steel at proper height.
04 Use type with sand cushion pads where concrete is on grade.

G. Form Ties:
01 Form Ties: Adjustable length and type which will not leave holes larger than 1 inch in diameter in the face of the concrete.

02 Ties shall be such that when forms are removed, no metal will be within 1 inch of the finished concrete surface.
03 The holes must be patched.

H. Curing Compound: Design is based on WR Meadows VOCOMP-20; or equal by an acceptable manufacturer.
01 Water based, dissipating curing compound for freshly placed concrete.
02 Comply with ASTM C309 Type II.
03 Minimum 18% solids.
04 Meets all VOC emission requirements.
05 Initially non-clear for visual verification of adequate coverage.

I. Cardboard Carton Void Forms: Permitted only if specifically indicated on the Drawings.
01 Wax impregnated, trapezoidal shape.
02 Use only if / where indicated on the Structural Drawings.

2.3 COLORED CONCRETE

A. Design of colored concrete is based on products / systems manufactured by Bomanite.

B. Field Colored Concrete: Equal to Bomanite “Color Hardener” system – Heavy Duty Grade for high wear resistance.
01 A blend of mineral oxide pigments, cement and graded silica aggregates applied to freshly placed concrete as recommended by the manufacturer.
02 Color as selected by Architect from full range of manufacturer’s colors.
03 Provide at all ramps as required by Americans with Disabilities Act and Texas Department of Licensing and Registration “Texas Accessibility Standards”.
04 Provide at all areas designated “Colored Concrete”.

C. Imprint System: Equal to Bomanite “Bomacron” textured imprint templates as selected by the Architect.
01 Pattern shall be light to medium texture “slate”.

D. Release Agent: As recommended by the manufacturer for the specific installation.

E. Curing Agent: Equal to Bomanite “Clear Cure”.

F. Sealing and Finishing Coat: Equal to Bomanite “Hydroblock”.

2.4 SLAB MEMBRANES

A. Refer to Section 03 15 19 – Below Slab Vapor Membranes.

PART 3 - EXECUTION

3.1 PREPARATION

A. General:
01 Clean all mixing and transportation equipment; remove debris from forms; wet forms thoroughly; remove ice or other coatings from reinforcement which might hinder good bond; remove water from place of deposit; and check reinforcement.

B. Accessories:
01 Install anchor bolts, slots, dove-tail anchor slots, boxes, sleeves and other required devices. Provide all such items not specified to be provided by other trades.

02 Provide temporary supports to maintain accessory location / position during concrete placement and initial finishing. Remove temporary supports as required.

C. Coordination:
01 Unless specifically shown or allowed in other Specification Sections and / or Drawings, no horizontal runs of conduit, piping or other work shall be allowed within the slab.
02 All underground conduit runs (if allowed) shall be trenched / installed within the building pad, a minimum 6” below the slab. Refer to Electrical Drawings and Specifications.
03 Exception to 02: Only conduit runs to floor mounted or recessed receptacles at finish floor may be installed above the slab membrane provided all following conditions are met:
a. 3/4" maximum conduit size allowed provided the conduit is recessed below the slab thickness indicated.
b. Length of conduit run is minimized to turn up at the nearest available building component (partition, furring, etc.) to allow conduit to be concealed above the slab.
c. Such installations are not specifically excluded in other Sections or the Drawings.
04 All penetrations through concrete grade beams and elevated beams shall be sleeved.
05 Coordinate with other Contractors / trades as required for proper installation of interfacing work; and monitoring of such work during placement and finishing of concrete. All interfacing work displaced during concrete placement will be required to be moved to proper location.

D. Subgrade:
01 Prior to placement of slab membrane, inspect the building pad / subgrade and verify that all foreign objects have been removed.
02 Verify that the subgrade is level, compacted and evenly graded. Hand rake where required.
03 Remove all material that could potentially puncture or stress the slab membrane.

E. Drilled Piers:
01 Do not begin drilled pier operations until provisions are in place to assure that placement of reinforcing and concrete shall occur as soon as possible after finishing drilling the pier.
02 In no case shall drilled piers be left open / unfinished overnight.

3.2 INSTALLATION

A. Drilled Piers:
01 Coordinate with Testing Lab technician to monitor and assure proper depths; as well as confirm suitability of subgrade at bottom of pier.
02 drilled piers are to be vertical, bore shafts plumb within tolerance of up to 2” over the length of the shaft.
03 To ensure proper bell / under ream size, use chains as required on the bell auger; or alternatively, use appropriate size bell auger.
04 Install closely spaced piers in alternating sequence as required to prevent caving and / or leakage of concrete.
05 Fill each pier with concrete as soon as practical. Under no circumstances shall drilled piers be left unfilled overnight.
06 Keep bell / under ream base thoroughly clean and free of water before concrete is placed.
07 Place and secure steel reinforcing cage, taking necessary care to keep cage centered with the proper amount of protrusion above the pier top.

08 Fill bell / under ream with concrete and vibrate with a pencil vibrator. Do not over vibrate.

09 After bell / under ream is poured, set reinforcing cage as required to allow for minimum 3" coverage of concrete at base. Dropping reinforcing cages into pier shall not be allowed.

10 Fill pier shaft with concrete up to required elevation. Once placed, consolidate concrete with a pencil vibrator. Do not over vibrate.

B. Forms:

01 Conform to the shapes, lines and dimensions of the members as shown on the drawings, except as modified under Section 31 20 00 – Earth Moving of these Specifications.

02 Care shall be taken to assure that formwork does not stain concrete surfaces.

03 Slab Block-Outs:

a. Diamond configuration at paving drains and building slabs.

b. Coordinate with concrete joints, verify with Architect.

04 Slope exterior concrete slabs away from building and slope interior slabs to floor drains. Verify all slopes with Architect prior to start of concreting.

05 Forms:

a. Grade beams shall be formed to the sizes indicated on the Drawings.

b. Where carton forms are not required, the contractor may omit forms of grade beams provided the grade beam is widened 1 1/2 inches on each side in contact with the earth.

c. The top 12 inches (minimum) of the outside faces of exposed perimeter grade beams must be formed. Unformed perimeter grade beams shall not be allowed above the surface of finish grading.

d. If forms are used, then the widening of the grade beams are not required.

06 Carton Forms: Permitted only if specifically indicated on the Drawings.

a. Where carton forms are required, both sides of the grade beam shall be formed.

b. Fasten carton form in place to eliminate movement / shifting during concrete placement.

c. Take all necessary precautions to keep carton forms dry prior to concrete placement. In the event they become wet, remove and replace with dry, rigid forms.

07 Slab Recesses and Sloped Surfaces:

a. Accurately form all slab recesses to depths indicated on the Drawings.

b. Where Drawings indicate slab(s) to slope, accurately form sloped areas and screed to provide a uniform slope.

c. Contractor shall have the option to form recessed and sloped areas a minimum of 2 inches deeper than indicated and top-out recess at a later date to finished elevations.

08 Form Removal:

a. Ensure safety of the structure.

b. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support their weight and the load thereon.

C. Vapor Membrane:

01 Refer to Section 03 15 19 – Below Slab Vapor Membrane.

02 Verify that vapor membrane installation is 100% complete and approved prior to start of reinforcement installation and / or slab prep work.

03 Immediately repair and / or replace vapor membrane if damaged during concrete work preparation or placement.

D. Reinforcing:

01 Cleaning Reinforcement: Free from rust, scale or other coatings which will destroy or reduce the bond.

02 Placing Reinforcement:

a. Place accurately and adequately secure in position.

b. Reinforcement in all concrete slabs shall be held in proper locations by use of plastic chairs spaced a maximum distance of 48 inches O.C., unless noted otherwise.

03 Coverage of Reinforcement: The metal reinforcement shall be protected by the thickness of concrete indicated on the plans.

a. 3-inch: Concrete deposited against ground without use of forms.

b. 2-inch: Bars more than 5/8 inch diameter where concrete is exposed to the weather, or exposed to the ground but placed in forms.

c. 1-1/2 inch: Bars 5/8 inch diameter where concrete is exposed to the weather, or exposed to the ground but placed in forms.

d. 3/4 to 1 inch: In slabs and walks not exposed to the ground nor to the weather, not less than 3/4 inch. Increase coverage and slab thickness at auditorium seating to miss seat anchors. Refer to Structural Drawings.

e. Not less than 1 1/2 inches in beams, girders and columns not exposed to the ground nor to the weather.

f. 1-1/2 to 1-3/4 inches from top: Paving.

E. Waterstops – Non-Rigid:

01 All non-rigid waterstops shall be installed in a continuous keyway cast into the (receiving) concrete. Keyways shall be formed with 2x4's with canted sides to form a trapezoid shape.

02 Concrete to receive non-rigid waterstops shall be dry and free of contaminants.

03 Where required, prime concrete in accordance with manufacturer's standards and recommendations.

04 Install non-rigid waterstops in continuous lengths, firmly adhered to receiving concrete surface.

05 Overlap at splice joints in accordance with manufacturer's standards and recommendations.

06 Leave protective wrapping in place until ready to cover with fresh concrete.

F. Waterstops –Rigid:

01 Install rigid waterstops continuously at all locations indicated on the Drawings.

02 Install in strict accordance with manaufacturer's standards and recommendations.

03 shall be installed in a continuous keyway cast into the (receiving) concrete. Keyways shall be formed with 2x4's with canted sides to form a trapezoid shape.

04 Install non-rigid waterstops in continuous lengths, firmly embedded in the receiving concrete material.

05 Overlap at splice joints to maintain continuity in accordance with manufacturer's standards and recommendations.

G. Joints:

01 Construction Joints:

a. Floor slabs shall be formed using metal screed joints. Verify locations of all control joints not indicated on the Drawings with the Architect, in ample time to avoid construction delay.

b. Use at cold joints in building.

02 Contraction Joints: Refer to Structural Drawings.

03 Expansion Joints:
a. Where walks and paving terminates against curbs or buildings, and at sides adjacent to curbs building or walls, whether detailed or not. Verify locations with the Architect if either redwood or asphalt impregnated fiber with sealant cap.

04 Tooled Joints: Provide scored lines on exterior concrete slabs and walks.

H. Concrete:

01 Batching, Mixing and Delivery Equipment: Use transit mixed concrete from approved batching and mixing plant. Batch, mix and transport concrete to the site in accordance with provisions of ASTM C94.

02 Inspection: Examine all areas and conditions under which the Work of this Section will be performed. Correct any conditions detrimental to the approved completion of the Work. Do not proceed until all such conditions are corrected.

03 Concrete Placement (general):
a. Place concrete in compliance with practices and recommendations of ACI-304, and as specified herein.
b. Do not deposit concrete on concrete which has hardened sufficiently to form seams or planes of weakness within the section.
c. Where a section cannot be placed continuously, provide construction joints.
d. Place concrete at such a rate that concrete which is being integrated with fresh concrete is still plastic.
e. Deposit concrete as nearly as practicable in its final location to avoid segregation due to re-handling and flowing. Do not subject concrete to any procedure which might cause segregation.
f. Screed concrete which is to receive other construction to the proper level, to avoid excessive skimming and grouting.
g. Do not use concrete which becomes non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign materials.

04 Placement Schedule: Place concrete in conformance with a placement schedule to ensure even distribution of loads.
a. Alternate placement to allow for shrinkage.
b. Where construction joints are shown or required, alternate panels, allowing a minimum of 7 days curing time prior to placing adjacent panels.

05 Conveying:
a. Handle concrete from point of delivery and transfer to conveying equipment to the location of final deposit as rapidly as practicable, and by methods which prevent segregation and loss of mix materials.
b. Provide runways for wheeled conveying equipment from delivery point to location of final deposit.
c. Keep interior surfaces of conveying equipment, including chutes and tremies, free from hardened concrete, debris, water and other deleterious materials.
d. Pumps may be used only if they can pump the designed mix. Do not add fine aggregate or water to the mix to satisfy needs of a pumping device.
e. Use chutes or tremies for placing concrete where a drop of 10'-0" or more is required.

06 Slab Placement:
a. Moisten subgrade the evening before and immediately prior to placement of all paving slabs.
b. Deposit and consolidate concrete slabs in a continuous operation, within the limits of any construction joints, until the placing of a panel or section is completed.

c. Consolidate concrete during placement by use of the specified equipment, thoroughly working concrete around reinforcement and into corners.
d. Consolidate concrete placed in beams and girders of supported slabs and against bulkhead of slabs on grade, as specified for formed concrete structures.
e. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds or other methods acceptable to the Architect.
f. Limit time of vibrating consolidation to prevent bringing an excess of fine aggregate to the surface.
g. Bring slab surfaces to correct level with a straight edge, and then strike off.
h. Use bull-floats or darbies to smooth the surface, leaving it free from bumps and hollows.
i. Do not sprinkle water on the plastic surface; do not disturb the slab surfaces prior to start of finishing operations.

07 Cold Weather Placing: Comply with ACI-306 to protect all concrete work from physical damage and reduce strength caused by frost, freezing actions, or low temperatures. Place no concrete against frozen earth.
a. No concrete shall be poured in temperatures 40 degrees or lower; or if such temperatures are anticipated within 8 hours of the pour.
b. Use of Calcium Chloride, accelerants, or additives shall not be permitted unless there is prior written approval by the Architect and Engineer of Record.

08 Hot Weather Placing: Prepare aggregates, mix water and other ingredients, and place, cure, and protect concrete in accordance with the requirements of ACI-305.

09 Consolidation:
a. Consolidate all concrete footings, piers, grade beams, slabs, paving, etc. in accordance with provisions of ACI-309.
b. Consolidate each layer of concrete immediately after placing, using internal concrete vibrators supplemented by hand-spading, rodding or tamping.
c. During all phases of operation, maintain a frequency of not less than 10,000 vibrations per minute per internal vibrator.
d. Provide adequate number of units and power source at all times. Maintain spare units on hand to ensure adequacy.
e. If, in the opinion of the Architect, the equipment is not adequate to accomplish proper consolidation, he may order delay in further placement until adequate equipment is made available.
f. Maintain vibrators to assure peak efficiency at all times during placement.

I. Colored Concrete – Color Hardener:

01 While concrete is still in the plastic stage of set, apply Bomanite Color Hardener prior to application of pattern.

02 Apply at rate recommended by manufacturer, evenly to the surface of the fresh concrete by the dry-shake method.

03 Apply in two or more shakes, floated after each shake and troweled only after the final floating.

04 While concrete is still in its plastic state, apply the tool / texture pattern to the surface of the concrete. Properly tamp tools into the surface to achieve the required texture, with uniformity of pattern and depth of stamping. Utilize bond breaker to keep tools from sticking to fresh concrete.

05 Release material shall be applied to the troweled surface prior to imprinting.

06 Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

07 Apply secondary stain treatment per approved mock-up or as scheduled to achieve design.

08 Apply finish sealer per approved mock-up or as specified to achieve design required.

09 Apply Bomanite recommended Colorwax in accordance with manufacturer's printed instructions in colors to match the colored concrete selected.

J. Wet Curing:

01 All interior slab areas shall be water cured for a minimum of five (5) days.

02 Maintain wetness of slab areas by suitable means (sprinklers, drip hoses, water blankets, etc.) for a minimum of five (5) days.

K. Curing Compound: Concrete work cured with a curing compound shall be performed in strict accordance with the manufacturer’s requirements and recommendations.

3.3 FINISHES AND TOLERANCES

A. Finishes – Grade Beams and Vertical Surfaces:

01 Exposed surfaces of all concrete walls and grade beams shall receive a rubbed finish, unless otherwise noted. Immediately after forms are removed, grout pits and recesses and rub with carborundum stone to a smooth finish, free from marks or honeycomb to the Architect's satisfaction. Finish exterior surface 2 inches below finish grade.

02 Rubbed finish shall be of the finest workmanship, with uniform texture and color.

03 Prepare samples for approval of Architect.

04 Protect all rubbed finish against damage during construction period. Immediately before requesting final acceptance of work, the Contractor shall remove protection and do such touch up and rubbing as necessary to leave rubbed surfaces in perfect condition.

05 Miscellaneous Vertical Surfaces: Finish all vertical surfaces, including but not limited to curbs, risers, low walls and stringer, while concrete is strong enough to stay in place without forms yet green and able to be finished to a homogeneous appearance.

B. Finishes – Interior Slabs:

01 Spreading of dry cement for finishing is not permitted.

02 Flooding floor is not permitted during finishing. A limited, light / sprinkled application of water shall be permitted.

03 Interior slabs to receive direct applied finish flooring: provide a troweled smooth flat matte finish capable allowing moisture within the slab to escape through capillary pores of the concrete surface.

04 Interior slabs to remain concrete: Provide a smooth, hard troweled finish.

05 Moisture mitigation required due to over troweling concrete slabs to the point that moisture is trapped within the concrete slab shall be at the Contractor’s sole risk and responsibility; and shall not be at any additional cost to the Owner.

06 Interior slabs to receive thickset / mud-bed finish flooring (mud-set terrazzo, thick-set quarry tile, etc.): floated, smooth finish. Coordinate exact requirements with flooring applicator.

C. Saw-Cut Joints in Slabs:

01 All joints to be saw-cut in slabs shall occur within six (6) hours of concrete placement.

02 All joints cut into green slabs shall be cut with an early entry saw specifically designed for cutting green concrete.

3.4 FIELD QUALITY CONTROL

A. Testing Laboratory: Perform the appropriate tests upon notification by the Contractor. Refer to Section 01 45 23 - Testing and Inspection Services.

B. Contractor shall take necessary precautions to not over-trowel concrete slabs to the point that the finish closes pores in the concrete.

C. Tolerances – Interior Slabs at Finish Floor to Receive Adhered Flooring Materials:
   01 True to plane within 3/16” over any 10-foot length, non-cumulative; ACI F-32.
   02 Verify any additional requirements with the flooring installer.

D. Tolerances – Recessed Interior Slabs to Receive Composite Wood Flooring Assemblies:
   01 True to plane within 1/8” over any 10-foot length, non-cumulative; ACI F-50.
   02 Verify any additional requirements with the flooring installer.

E. Tolerances – Recessed Interior Slabs to Receive Built-Up or Thick-Set Flooring:
   01 True to plane within 5/16” over any 10-foot length, non-cumulative; ACI F-20.
   02 Verify any additional requirements with the surfacing installer.

F. Exterior Concrete Slabs: Refer to Section 32 13 13 – Concrete Paving and Flatwork.

3.5 PATCHING AND CLEANING

A. After forms are removed, remove projecting fins, bolts, form ties, nails, etc., not necessary for the work, or cut back 1 inch from the surface. Where, in the Architect's opinion, surface defects occur, such as honeycombing, repair the defective areas as directed by the Architect. Joint marks and fins in exposed work shall be smoothed off and cleaned as directed by the Architect.

B. Repair defects in concrete work per ACI-301, Chapter 9, and as directed by the Architect. Chip voids and stone pockets to a depth of 1 inch or more as required to remove all loose material. Voids, surface irregularities, chipped areas, etc., shall be filled by patching, gunite or rubbing, as directed by the Architect. Repaired surfaces shall duplicate appearance of unpatched work.

C. Clean exposed concrete surfaces and adjoining work stained by leakage of concrete to the approval of the Architect.

D. Reinforce or replace any deficient work as directed by the Architect, and at no additional cost to the Owner.

3.6 CLEAN - UP

A. In addition to the requirements of General Conditions, clean up all concrete and cement work on completion of this portion of the work, except protective coating or building papers shall remain until floors have completely cured or until interior partitions are to be installed.

END OF SECTION

SECTION 03 52 16.19

LIGHTWEIGHT INSULATING CONCRETE

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide lightweight insulating concrete deck at roof as indicated on the Drawings.
   02 Includes lightweight insulating concrete decks installed on structural steel metal deck and cementitious wood fiber decks.
   03 Provide all materials and accessories required for a complete installation.

C. Related Work:
   01 Section 05 31 00 – Steel Decking
   02 Section 06 10 00 – Rough Carpentry
   03 Section 07 54 19 – Thermoplastic Single-Ply Membrane Roofing
   04 Section 07 72 00 – Roof Accessories
   05 Section 07 72 23 – Roof Hatches and Vents

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Mix Design: Indicate materials and proportions of proposed mix.
   02 Manufacturer's letter of certification of the approved installer.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

F. Manufacturer's specifications and other data for all products proposed to be furnished as needed to prove compliance with specified requirements.

G. Manufacturer’s letter of certification of the approved installer.

1.3 REFERENCES

A. American Society for Testing and Material:
01 ASTM C150 – Standard Specifications for Portland Cement.
02 ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
03 ASTM C495 – Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.
04 ASTM C513 – Standard Test Method for obtaining Specimens of Hardened Lightweight Insulating Concrete for Compressive Strength.
05 ASTM C578 – Standard Specifications for Rigid Cellular Polystyrene Thermal Insulation.
06 ASTM C796 – Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam.
07 ASTM C869, Standard Specifications for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.
08 ASTM C1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
09 ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials.
10 ASTM E329 – Standard Specifications for Agencies Engaged in Construction Inspection, Testing and Special Inspection.

B. Comply with all applicable recommendations of American National Standard Institute (ANSI) A122.1, and any others referred to herein. In any conflict between referenced standards, the more stringent requirements shall govern.
01 ANSI / SPRI FX-1-2006 – Standard Field Test Procedures for Determining the Withdrawal Resistance of Roofing Fasteners.

1.4 QUALITY ASSURANCE AND TESTING PROCEDURES

A. Acceptable Applicators:
01 Applicator must be approved / licensed by the system manufacturer. Approval shall be confirmed in writing to the Architect. Written approval by the manufacturer for the applicator shall include the project by name.
02 Applicator must have at least five (5) years of satisfactory experience installing the specified system.
03 Upon request by the Architect, provide a list of at three (3) projects where the applicator has installed the specified / proposed lightweight insulating concrete deck. List shall include the name and contact information of the Project Architect and General Contractor.

B. Testing Laboratory Services:
01 The Owner will select the Testing Laboratory and pay for the cost of tests to determine the dry density and compressive strength of the lightweight insulating concrete deck. Testing shall be determined in accordance with ASTM C495.

C. Quality Assurance:
   01 The roofing assembly shall conform to the requirements of meeting the specified wind load; refer to requirements described on the Drawings.
   02 The system manufacturer's product shall be UL classified and listed in the current Underwriters Laboratories "Fire Resistance Design Directory".

D. Building / Construction Components:
   01 Meet or exceed established standards.

1.5 ROOF SYSTEM COORDINATION

A. Coordinate with roofing manufacturer / Contractor as required to assure compatibility of the lightweight insulating roof deck with the performance and installation criteria of the specified basis of design roofing system.

B. If a roofing system other than the basis of design system is used on the project, coordinate as required to assure compatibility of the light-weight insulating roof deck with the performance and installation criteria of the roofing system.

C. Modify the design performance of the lightweight insulating roof deck as required to meet requirements of the roofing system to be installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design of Lightweight Insulating Concrete is based on systems / products manufactured and supplied by Celcore.

B. The following additional manufacturers are acceptable to provide the work of this Section, provided their proposed systems / products meet or exceed all specified requirements:
   01 Elastizell
   02 Mearlcrete

2.2 LIGHTWEIGHT CONCRETE

C. Cellular:
   01 Foaming agent shall comply with ASTM C869 when tested in accordance with ASTM C796.
   02 Cast density of 36 to 44 PCF.
   03 Minimum dry density of 26 PCF.
   04 Minimum 28-day compressive strength of 350 PSI.

D. Cement: Portland, conforming to ASTM C150, Type I, I/II or III.

E. Admixture: As recommended and approved by system manufacturer.

F. Reinforcing Fibers: shall be monofilament type and shall not exceed 1.5 PCY.

G. Water: Free from any materials harmful to concrete or structural steel deck.

H. Expansion Joint Material: 1" thick fiberglass approved by the manufacturer for use in conjunction with and insulating concrete deck.

I. Metal Deck: Refer to Structural Drawings and Specifications for size, type and section modulus of metal deck.
   01 Steel deck perforations for aggregate insulating concrete shall not exceed 1.5% open area.
   02 Steel deck vent perforations for cellular insulating concrete shall not exceed 0.75% open area.

J. Curing Compound: As required by the insulating concrete manufacturer and applied in accordance with the manufacturer's instructions.

2.3 INSULATION BOARD

A. Rigid, closed cell, un-faced Expanded Polystyrene (EPS) board stock complying with ASTM C578.
   01 Approved Product: Alleguard

B. Thickness: six (6) inches minimum.

C. Nominal Density: 1.0 PCF, Type I.

D. Fire Resistance: Flame spread – ASTM E84. Smoke Density – ASTM E84.

E. Provide a minimum of six (6) 3" diameter bond holes for each 8 SF of board.

2.4 DESIGN OF ROOF DRAINAGE

A. The design to drain roof areas, whether to roof drains or gutters, is generally accomplished by sloping the underlying steel structure sloping to the drainage vehicle.

B. In areas of the roof that are shown to be cricketed or similar, provide tapered rigid insulation or build up surface of lightweight concrete above the EPS insulation in the patterns shown or required to facilitate full drainage of the roof surface.
   01 Area to slope at 1/4" per foot unless noted otherwise.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Prior to erection of forms, inspect structural deck to ensure all work is complete and suitable for this installation to progress.

B. Prior to placing insulating concrete, inspect corrugated metal forms to ensure that they are secured to the structure and free of debris or foreign materials.

C. Verify that all deficiencies have been corrected prior to commencing installation.

D. Weather:
   01 Insulating concrete roof decks may be placed when temperatures are 40°F and rising.
   02 If colder temperatures are anticipated, the Applicator shall take suitable precautions for the installation of an acceptable deck.
   03 Do not place insulating concrete deck during precipitation or when there is a likely expectation that precipitation will occur during installation.
   04 Adverse weather precautions, actions and remedies shall be in strict accordance with the system manufacturer's standards and recommendations.

E. The roofing membrane system application must be coordinated with the insulating concrete installation to avoid prolonged exposure of the roof deck.

3.2 INSTALLATION

A. Lightweight concrete shall be mixed in accordance with manufacturer's standards and recommendations.

B. Fill valleys / voids of structural metal deck with a leveling thickness of lightweight concrete fill.

C. Install EPS rigid insulation board in the fresh bond coat of lightweight concrete fill.
   01 Install insulation board in fresh bond coat layer in such a manner that results in the underside of insulation boards making full coverage contact with bond coat layer.
   02 EPS board shall be held back 3(+) inches from the perimeter / edges of the roof deck. Voids to be filled with lightweight concrete fill.

D. The EPS layer shall be placed and allowed to set overnight, undisturbed, prior to installation of the lightweight concrete roof deck topping layer.

E. Where required, place reinforcing mesh with longitudinal wires at right angles to structural supports.
   01 Lap 6 inches and tie at intersections, both sides and ends.
   02 Ensure that mesh is in approximate center of the topping fill depth.

F. Install a minimum of 2" thickness of lightweight concrete fill over EPS board, filling all bond holes, perimeter voids and other locations to produce a smooth surface suitable for the installation of the specified roofing system.
   01 The surface to receive lightweight concrete fill shall be dry, free of water, dew, frost, ice and snow at the time of placement.

G. Where indicated on the Drawings increase depth of lightweight concrete fill as required to form crickets, etc. required for positive drainage.

H. Insulating concrete shall be screeded to the proper thickness and slope with a surface free of ridges and sharp projections prior to installation of the roofing membrane.

I. Cure roof deck topping in accordance with the system manufacturer's standards and recommendations.

3.3 FIELD QUALITY CONTROL AND TESTING

A. Check the cast density at the point of placement and adjust the mix to obtain the required cast density.
   01 End of hose cast density checks shall be taken, at minimum, every thirty (30) minutes at the point of placement.
   02 Do not rod specimens.
   03 A set of test specimens shall be considered to be six (6) 3x6 cylinders made from the same sampling.
   04 Four (4) specimens from each set shall be tested for compressive strength and two (2) for dry density.

B. Protect samples from damage and temperature extremes and test accordingly at 28 days to ASTM C495.

C. Applicator shall have test equipment available on job site at all times during pouring of insulating concrete for testing slump and cast density.
   01 Slump shall not exceed 5 inches.

D. Pull Test: Conduct pull tests to document / substantiate the lightweight concrete deck meets or exceeds the minimum pull-out requirements of the specified roofing system.
   01 Testing shall be done and recorded in accordance with ANSI / SPRI FX-1-2006.

3.4 COORDINATION WITH ROOFING WORK

A. Confirm prior to placement of the lightweight concrete that the specified roof system is compatible with the type of insulating concrete to be installed.

B. Begin roofing when the insulating concrete roof deck has open air cured sufficiently to a point where subsequent work can progress without damage to the lightweight insulating concrete deck.
   01 This is usually 3 to 5 days after the deck has been placed.
   02 Confirm the Contractor has coordinated with roofing installer as required.

C. The roof deck should not be left exposed for longer than 5 to 7 days following open-air cure period.

D. Consult the roofing manufacturers for their recommended attachment of the roofing system to the insulating concrete roof deck system.

3.5 REPAIRS

A. Where required to provide surface conditions suitable to receive the specified roof system, repairs to smooth the deck surface, correct depressions or fill divots shall be performed in accordance with written guidance provided by the systems manufacturer.

B. Remove and replace any area of the roof deck that fails to comply with the requirements of the systems manufacturer, this Specification or applicable product approval.

END OF SECTION

SECTION 03 54 17

SELF LEVELING FLOOR UNDERLAYMENT

CONDITIONS OF THE CONTRACT, DIVISION 0 and DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Provide Self-Leveling Portland cement-based underlayment for use as needed over concrete finishes as required for proper installation of finish flooring materials within spec.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Floor Finishes, Division 9

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of location and scope of installations.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.

1.3 QUALITY ASSURANCE

A. Installation of Self-Leveling Portland cement-based underlayment must be by an applicator using mixing equipment and tools approved by the manufacturer.

B. Underlayment shall be able to be installed from 1/8 inch to 1-1/2 inch in one pour and up to 5 inches with the addition of aggregate. It may also be feathered to match existing elevations.

C. Underlayment to be applied to a minimum thickness of 1/8 inch over highest point in the subfloor, with an average typical thickness of 1/4 inch.

D. Underlayment compressive strength shall be 4,100 psi after 28 days in accordance with ASTM C109/mod (air cure only).

E. Underlayment shall be walkable after 2 hours and allow floor covering to be installed after 16 hours at 70 degrees F.

F. Manufacturer's certification that the product is Portland cement-based having an inorganic binder content which is a minimum 80 percent Portland cement when tested in accordance with ASTM C150: Standard Specification for Portland Cement.

G. Qualifications
   01 Installer Qualifications: All work in this section shall be performed by a factory trained applicator with minimum five years experience in the installation of cementitious underlayment material.
   02 Manufacturer Qualifications: Obtain required products from a single manufacturer specializing in the production of products of this type for not less than 20 Years.
   03 Manufacturer to provide confirmation installation procedures.

H. Field Samples
   01 Prior to the installation of work place field sample of underlayment material at a location directed by or acceptable to the architect.
      a. Minimum size – 4'-0" by 4'-0".
      b. Show featheredge condition
      c. Accepted sample may remain as part of work as directed by architect, rejected samples must be demolished and removed from site.

I. Allowable Tolerances
   01 Variation from level: Do not exceed 1/8 inch in any bay or 10 feet in distance.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their unopened packages and protect from extreme temperatures and moisture. Protect liquids from freezing.

1.5 SITE CONDITIONS

A. The product is a cementitious material. Observe the basic rules of concrete work. Do not install below 50 degrees F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the manufacturer's Technical Service Department. Never mix with cement or additives other than the manufacturer's approved products.

B. Do not proceed with installation until temperature and relative humidity have been stabilized and been maintained within values established by the manufacturer for optimum quality control.

C. Provide adequate ventilation to prevent accumulation of hazardous fumes during application of components in enclosed spaces and maintain ventilation until materials have thoroughly cured.

1.6 WARRANTY

A. Minimum Warranty – 5 year product and installation.

PART 2 - PRODUCTS

2.1 APPROVED PRODUCT/MANUFACTURER

A. Design of self leveling floor underlayment is based on products manufactured by Ardex Engineering Cements.

B. The following manufacturers are acceptable to provide products of this Section provided they meet or exceed all specified requirements.
   01 Henry Company
   02 Mapei

C. Product for level applications: ARDEX K-15 Self-Leveling Underlayment Concrete.

D. Product for sloped applications: ARDEX SD-P, Self-Drying Patch.

E. Primer for standard absorbent concrete shall be ARDEX P-51 Primer.

F. Primer for non-porous subfloors, cutback and other non-water-soluble adhesive residues, metal, and wooden subfloors shall be ARDEX P-82 Ultra Prime.

G. The additive to be mixed with ARDEX K-15 when used over cutback adhesive, other non- water soluble adhesives, metal, or wooden subfloors shall be ARDEX E-25 Resilient Emulsion.

H. Aggregate shall be well graded, washed gravel (1/8 inch to 1/4 inch or larger) for use when underlayment is installed over 1-1/2 inches thick.

I. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

2.2 MIX DESIGNS

A. Standard mixing ratio: ARDEX K-15 is mixed in 2-bag batches at one time. Mix each bag of ARDEX K-15 (55 lb.) with 7 quarts of water. Product shall be mixed in an ARDEX T-10 Mixing Drum using an ARDEX T-1
   01 Mixing Paddle and a 1/2 inch heavy-duty drill (min. 650 rpm).
   02 Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture.
   03 Follow written instructions per the ARDEX K-15 bag label.

B. Resilient mix for applications over cutback and non-water soluble adhesive residues, wood, and metal: Use 6 qt. of water and 2 qt. of ARDEX E-25 Resilient Emulsion for each bag of ARDEX K-15.

C. Aggregate mix: For areas to be installed over 1-1/2 inches thick, aggregate may be added to reduce material costs. Mix ARDEX K-15 with water first, then add from 1/3 up to 1 part by volume of aggregate (1/8 inch to 1/4 inch or larger). Do not use sand.

D. For pump installations, ARDEX K-15 shall be mixed using an ARDEX Levelcraft Automatic Mixing Pump.
   01 Start the pump at 210 gallons of water per hour, and then adjust to the minimum water reading that still allows self-leveling properties.
   02 Do not over-water.
   03 Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck.
   04 Conditions during the installation, such as variations in water, powder, substrate, and ambient temperature, require that the water setting be monitored and adjusted carefully to avoid over watering.

PART 3 - EXECUTION

3.1 PREPARATION

A. All subfloors must be sound, solid, clean, and primed:
   01 All concrete subfloors must be of adequate strength, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
   02 Wooden subfloors must be clean and free of all foreign matter. Sand to bare wood then vacuum to remove all dust. Re-nail any loose boards exhibiting movement.
   03 Metal subfloors must be clean and free of all rust and foreign matter. Where required, a corrosive resistant coating should be applied and allowed to dry before priming.
   04 Cutback and other non-water soluble adhesive residues must be wet scraped to a thin, well-bonded layer.
   05 Non-porous subfloors such as ceramic and quarry tile as well as terrazzo should be clean and free of all waxes and sealers. If necessary, have the surface professionally cleaned.
   06 All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.
   07 Substrates shall be inspected and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering.

B. Joint Preparation:
   01 Moving Joints - honor all expansion and isolation joints up through the underlayment.
   02 Saw Cuts and Control Joints - fill all non-moving joints with ARDEX SD-F Feather Finish or ARDEX SD-P InstantPatch, as required.

C. Priming:
   01 Primer for standard absorbent concrete subfloors: Mix ARDEX P-51 1:1 with water and apply evenly with a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (min. 3 hours, max. 24 hours). Underlayment shall not be applied until the primer is dry. Primer coverage is approximately 400 to 600 sq. ft. per gallon.
   02 Primer for extremely absorbent concrete subfloors: Make an initial application of ARDEX P-51mixed with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly before proceeding with the standard application of primer as described above for standard absorbent concrete.
   03 Primer for non-porous subfloors, wooden or metal subfloors, or cutback and other non-water soluble adhesive residues over concrete: Prime with ARDEX P-82 Ultra Prime. Mix Part A (red) with Part B (white) and apply with a short-nap or sponge paint roller, leaving a thin coat of primer no heavier than a thin coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tack film (minimum 3 hours, maximum 24 hours). Underlayment shall not be installed until primer is dry. Primer coverage is approximately 200 to 400 square feet per gallon.
   04 Minimum drying time for ARDEX P-82 Ultra-Prime over cutback adhesive is 18 hours.

3.2 APPLICATION OF UNDERLAYMENT

A. Installation:

01 Wooden subfloors require the use of the mesh-reinforced ARDEX K-15 + E-25 Underlayment System. After priming, install 3.2 or 3.4 galvanized diamond metal lath by stapling to the wooden subfloor approximately every 6 inches on center.

02 Steel subfloors require that the substrate first be primed with an anti-corrosive paint. After thorough drying of the paint, prime this surface with ARDEX P-82 Ultra Prime.

03 Pour or pump the liquid ARDEX K-15 and spread in place with the ARDEX T-4 Spreader. Use the ARDEX T-5 Smoother for featheredge and touch-up. Wear baseball or soccer shoes with non-metallic cleats to avoid leaving marks in the liquid ARDEX K-15. Underlayment can be walked on in 2-3 hours at 70 degrees F.

04 Ten bags is for use with the owner's prior approval and not to be used due to poor workmanship associated with this contract. Save used bags for observation and verification by the architect.

3.3 PREPARATION FOR FLOORING INSTALLATION

A. Underlayment can accept finish floor covering materials after 16 hours at 70 degrees F and 50 percent relative humidity.

B. Due to the wide range of adhesives that are used to install floor coverings, some adhesives may dry more quickly over Ardex underlayments than over other substrates. If this condition occurs, priming the surface of the underlayment with ARDEX P-51 Primer diluted 1:3 with water will even out the drying of the adhesive. Allow the primer to dry 1-3 hours before proceeding with the adhesive installation.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all concrete masonry unit (CMU) masonry work where indicated on the Drawings and as required for a complete installation.
   02 Provide all face brick masonry work where indicated on the Drawings and as required for a complete installation.
   03 Provide all masonry reinforcing and ties as specified here-in; and required for a complete installation.
   04 Provide water repellant application to exterior veneer masonry.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 07 21 00 – Thermal Insulation
   03 Section 07 25 00 – Weather Barrier

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Samples:
   01 Each type of face brick proposed to be furnished in quantities sufficient to show range of color where applicable.
   02 Samples of brick ties proposed to be furnished.
   03 Samples of full range of actual mortar color selections. Paper or digital samples are not acceptable.
   04 Sample of mortar deflector proposed to be furnished.

D. Sample Wall Panel: Sample panel shall be 8' long min. x 6' high panel showing selected face brick color range and texture, bonding, mortar color, joint shape, and quality workmanship.
   01 Panel shall be "L" shaped (4' min. x 6') with metal stud / drywall back-up wall on one side and CMU back-up on one side. Coordinate as required with other trades. Include window frame mock-up in each panel.
   02 Include a brick expansion joint. Sample panel shall remain at the jobsite until all masonry is completed.
   03 Once accepted by the Architect, the sample panel shall be the standard by which installed CMU and face brick masonry shall be judged.
   04 Sample wall shall remain in place until all masonry work is complete.

E. Operations and Maintenance Manuals:
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to Section 01 78 23 – Operations and Maintenance Manuals.
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

F. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American Society for Testing and Materials:
   01 ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   02 ASTM C43 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
   03 ASTM C62 – Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)
   04 ASTM C67 – Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
   05 ASTM C90 – Standard Specification for Loadbearing Concrete Masonry Units
   06 ASTM C216 – Standard Specifications for Facing Brick.
   07 ASTM C476 – Standard Specifications for Grout for Masonry.
   08 ASTM C652 – Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale)
   09 ASTM C744 – Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
   10 ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
   11 ASTM D5095 – Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatment
   12 ASTM D6490 – Standard Test Method for Water Vapor Transmission of Non-Film Forming Treatments Used on Cementitious Panels
   13 ASTM D6532 – Standard Test Method for Evaluation of the Effect of Clear Water Repellent Treatments on Water Absorption of Hydraulic Cement Mortar Specimens

B. Brick Industry Association (BIA).

C. National Concrete Masonry Association (NCMA).

D. National Fire Protection Association (NFPA) 285 – Standard Fire Test Methods for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Materials.

1.4 TESTS AND INSPECTIONS

A. Architect may require tests and inspections as necessary to verify quality and strength of brick materials, mortar, grout, and workmanship.
   01 Material tests shall be made on actual materials as they are being installed on the project.
   02 Contractor shall coordinate and cooperate with testing lab as required for tests to be conducted.

B. Laboratory tests of materials, mortar, grout and prisms shall be made per ASTM standard procedures.

C. Contractor shall coordinate with testing lab as required to provide the necessary materials and samples.

D. Owner will select Testing Laboratory and Owner will pay for all work required by Testing Laboratory.

1.5 DELIVERY, STORAGE AND PROTECTION

A. Store all materials above the ground to prevent contamination by dirt, rust or other materials which may cause staining or other blemishes and defects.

B. Store concrete and clay masonry units under cover and keep dry until used for installation.

C. Store in manufacturer's original containers until opened for installation.

D. Cementitious materials or admixtures in opened / broken containers or in packaging showing water marks or evidence of other damage shall be removed from the site and not used for installation.

E. Bulk sand used for mixing mortar shall be placed on a waterproof membrane sufficient to prevent intrusion of ground water into the sand; and similarly, shall be covered as required to prevent intrusion of water / rain.

1.6 SITE CONDITIONS

A. Cold Weather Protection: No masonry shall be laid when the temperature of the outside air is below 40°F unless protection measures are employed and pre-approved by the Architect.

B. Protection measures for cold weather erection include maintaining space and masonry unit temperatures of at least 40°F for 48 hours, prior to and after erection.

1.7 WARRANTY

A. Warrant the masonry work specified herein for two (2) years after Substantial Completion against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials or workmanship.

B. Defects shall include, but not be limited to the following:
   01 Noticeable deterioration of masonry unit or mortar finish.
   02 Chalking or dusting excessively.
   03 Changing sheen in irregular fashion.
   04 Efflorescence.

C. Warrant the masonry water repellant work specified herein for five (5) years after Substantial Completion against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials or workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Concrete Masonry Units – CMU: Design is based on products manufactured by Best Block Company.
   01 Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
      a. Boral Concrete Products
      b. Eagle-Cordell
      c. Featherlite
      d. IPC
      e. Revels Block & Brick Co.

B. Acceptable Manufacturers - Face Brick: design is based on products manufactured by Cloud Ceramics. Provide the following face brick where indicated on the Drawings:

C. Masonry Reinforcement, Anchors and Ties: design is based on products manufactured by Hohmann &Barnard (HB).
   01 Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
      a. Dayton Superior / Dur-O-Wal
      b. Wire-Bond

D. Mortar Dropping Deflector: design is based on products manufactured by Mortar Net.
   01 Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
      a. Heckman
      b. Hohmann &Barnard (HB)
      c. Polyguard Products

E. Weep Hole Inserts: design is based on products manufactured by Hohmann & Barnard (HB).
   01 Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
      a. Advanced Building Products
      b. Heckman Building Products
      c. Wire Bond

F. Masonry Cleaning Products: design is based on products manufactured by Prosoco.
   01 Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
      a. CBR Products
      b. Diedrich Technologies
      c. Dumond Chemicals

G. Masonry Water Repellants: design is based on products manufactured by Prosoco.
   01 Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
      a. Tnemec.

b. United Golsonite Laboratories (UGL).

2.2 MASONRY MATERIALS

A. Concrete Masonry Units:
   01 Face Dimensions: 8" x 16", modular depths (4”, 6”, 8”, 12”) as indicated on Drawings.
   02 Color shall be standard gray.
   03 Comply with ASTM C90.
      a. Grade: N, highest standard
      b. Type: I, Moisture -controlled unit
      c. Aggregate: Lightweight
   04 When tested as a component of a masonry prism, CMU shall have a minimum compressive strength of 1,900 PSI, or higher if indicated on the Structural Drawings.
   05 Provide class D-2 units at 2-hour rated walls; class D-3 at 3-hour rated walls.
   06 Curing: Rotary kiln process.
   07 Provide bullnose units at all outside corners; except at walls to receive ceramic tile finish. Coordinate as required.
   08 Complete with bond beam, control joints, jambs, lintels, soaps and fillers to match and compliment standard CMU.

B. Masonry Veneer - Face Brick:
   01 Size: King Size (2-5/8" x 9-5/8" x 3").
   02 Brick:
      a. Brick A – Exterior Field Brick: Cloud Ash Gray Velour.
      b. Brick B – Exterior Wainscot Brick: Cloud Midnight Iron Spot Velour.
      c. Brick C – Exterior Accent Brick: Palmetto Whitestone.
   03 All face brick shall comply with ASTM C216, Grade SW, type FBX.
   04 Provide solids as required to ensure against exposed cores or unfinished faces or ends.
   05 Provide special shapes as indicated on the Drawings.

2.3 MORTAR MATERIALS

A. Type “S” Mortar:
   01 Use at all CMU masonry work, unless noted otherwise on the Structural Drawings.
   02 Hydrated Lime: ASTM C207, TYPE "S"
   03 Portland Cement: ASTM C150, Type 1
   04 Water: Clean and potable
   05 Sand: ASTM C144
   06 Type “S” Mix Design: (Proportions by volume):
      a. Type: ASTM C270, Type "S"
      b. Proportions: 2 parts cement, 1-part hydrated lime and 9 parts sand to provide a compressive strength of 1800 PSI in 28 days.
      c. Mixing: Thoroughly machine-mix for at least 5 minutes after all material is in mixer.
   07 Do not use calcium chloride.

B. Type “N” Mortar:
   01 Use at all masonry veneer work.
   02 Hydrated Lime: ASTM C207, TYPE “N” or “S”
   03 Portland Cement: ASTM C150, Type 1
   04 Water: Clean and potable
   05 Sand: ASTM C144
   06 Type “N” Mix Design: (Proportions by volume)

a. Type: ASTM C270, Type “N”
b. Proportions: 1-part cement, 1-part hydrated lime and 6 parts sand to provide a compressive strength of minimum 750 PSI in 28 days.
c. Mixing: Thoroughly machine-mix for at least 5 minutes after all material is in mixer.

07 Do not use calcium chloride.

C. Mortar Colors:
01 Provide standard gray mortar for all concealed masonry and masonry to receive a painted finish.
02 Mortar at exposed / unfinished masonry shall be as selected by the Architect from manufacturer’s full range of mortar colors – minimum of 12.

D. Site Mixed Mortar:
01 All site mixed masonry components shall be added to mixer using quantifiable mixing containers (i.e. cubic-foot boxes, known quantity liquid devices and similar containers).
02 Adding components by shovel is not permitted.

E. Mortar Deflector:
01 3-dimensional, polypropylene or polyethylene mesh product designed to be a continuous application at the base of a brick ledge.
02 Deflector shall be dual level to eliminate continuous build-up of mortar on the upper edge.
03 Deflector shall fill the width of the brick cavity up to minus (-) 1/2".
04 Deflector shall be non-corrosive.
05 Provide continuous at base of all brick veneer, brick ledges, lintels and metal through-wall flashing conditions.

F. Weep Hole Inserts:
01 Design is based on HB QV-Quadro Vent Weep Hole Insert.
02 Polypropylene honeycomb unit to be installed at brick veneer weep holes.
03 Conforming to ASTM D2240, D790B, D638 and D1238B.
04 Size to fit the head dimension of the brick unit being used.
05 Unit to be installed flush with the exterior face of the veneer.
06 Color to be selected from manufacturer’s standard finishes.
07 Provide at all weep holes.

2.4 MASONRY REINFORCING MATERIALS

A. General:
01 All masonry reinforcing shall be hot-dipped galvanized after fabrication in accordance with ASTM A153.
02 All truss type reinforcing shall be fabricated using be 9-gauge rod materials unless noted / specified otherwise.
03 All truss type reinforcing shall be furnished with prefabricated corners and tees to be used where applicable.
04 All truss type reinforcing shall be provided in nominal widths, 2” less than masonry it is being installed in.

B. Truss Type Reinforcing – Single Wythe Masonry:
01 Design is based on HB no. 120 Lox-All Truss-Mesh or Ladder-Mesh Joint Reinforcing.
02 Provide in continuous lengths wherever possible.
03 Spacing: nominal 16” O.C. vertically

C. Truss Type Reinforcing – Multiple Wythe CMU Composite Walls:
   01 Design is based on HB no. 140 Lox-All Truss-Mesh or Ladder-Mesh Joint Reinforcing.
   02 Provide in continuous lengths wherever possible.
   03 Spacing: nominal 16” O.C. vertically.

D. Truss Type Reinforcing – CMU Back-Up Walls With Brick Veneer:
   01 Design is based on HB no. 170 Lox-All Truss Style Adjustable Joint Reinforcement.
   02 Provide with 3/16” Eyes and Pintles.
   03 Provide pintle length / size as required to extend to 3/4" to 1” from outside face of masonry veneer.
   04 Pintles shall allow for a minimum of 1-1/4” vertical adjustment. Provide in greater adjustment configuration where required due to masonry coursing.
   05 Provide in continuous lengths in horizontal joints.
   06 Spacing: nominal 16” O.C. vertically; eyes and pintles at 16” O.C. horizontally.

E. Masonry Ties – Veneer at Metal Stud Back-Up Walls – With Rigid Insulation:
   01 Design is based on HB no. HB-213 series 2-Piece Adjustable Anchors.
   02 L-shaped plate bracket; 12-gauge material.
   03 Provide with 3/16” pintles.
   04 Provide pintle length / size as required to extend to 3/4" to 1” from outside face of masonry veneer.
   05 Pintles shall allow for a minimum of 1-1/4” vertical adjustment. Provide in greater adjustment configuration where required due to masonry coursing.
   06 Spacing: nominal 16” O.C. vertically; and 16” O.C. horizontally.

F. Masonry Ties – Veneer at Metal Stud Back-Up Walls – Without Rigid Insulation:
   01 Design is based on HB no. DW-10HS series 2-Piece Veneer Anchors.
   02 Slotted, 5-1/2” long plate bracket; 12-gauge material.
   03 Provide with 3/16” triangular wire tie.
   04 Provide wire tie length / size as required to extend to 3/4" to 1” from outside face of masonry veneer.
   05 Pintles shall allow for a minimum of 1-1/4” vertical adjustment. Provide in greater adjustment configuration where required due to masonry coursing.
   06 Spacing: nominal 16” O.C. vertically; and 16” O.C. horizontally.

G. Masonry Ties – Steel:
   01 Design is based on HB series 359 2-piece anchors welded to steel structure / components.
   02 Provide with 3/16” triangular wire tie.
   03 Provide wire tie length / size as required to extend to 3/4" to 1” from outside face of masonry veneer.
   04 Pintles shall allow for a minimum of 1-1/4” vertical adjustment. Provide in greater adjustment configuration where required due to masonry coursing.
   05 Spacing: nominal 16” O.C. vertically; and 16” O.C. horizontally.

H. Control Joint Anchors:
   01 Masonry Veneer and CMU Control Joints: design is based on HB Corrugated Control Joint Anchor.
   02 Material: Type 304 stainless steel
   03 Size: 6-1/4” x 1” x 22 gauge
   04 Install at all horizontally reinforced joints of masonry veneer and CMU.

I. All fasteners used to connect masonry ties and similar products through the weather barrier shall be cadmium plated and provided with neoprene washers.

2.5 CMU MASONRY REINFORCING

A. Refer to Structural Drawings for additional information.

B. All reinforced CMU masonry reinforced with grade 60 rebar and cells filled with grout.
   01 Grout shall meet or exceed requirements of ASTM C476.
   02 Grout shall be a blend of cement, sand, aggregate and water required to create a flowable mixture.
   03 Grout compressive strength shall be a minimum of 2,000 PSI at 28 days.
   04 Use at all vertical reinforced cells, hollow metal doors frames, bond beams, lintels and other locations indicated on the Drawings or required for a complete masonry installation.
   05 Refer to Structural Drawings for additional information and requirements.

C. Coordinate as required for installation of rebar dowels set in concrete foundation to connect to all CMU vertical reinforced cells.
   01 Unless noted otherwise, rebar dowels for 8” or larger CMU shall be #5 rebar, 30” in length, embedded nominally 12” into concrete foundation.
   02 Unless noted otherwise, rebar dowels for 6” CMU shall be #4 rebar, 30” in length, embedded nominally 12” into concrete foundation.
   03 Reinforcing shall be continuous from slab to top of wall. Splice in accordance with Section 03 30 00 – Cast-in-Place Concrete.
   04 Vertical reinforcing shall tie to reinforcing at bond beams and lintels.

D. Unless noted more stringent on the Structural Drawings, provide reinforcing in vertical CMU cells at the following locations:
   01 General Field / Run of Walls: 48” O.C. maximum.
   02 End of Walls: at end cell.
   03 Wall Corners: at corner cell and adjacent cell each side.
   04 Wall Intersections: two cells at intersection (one each wall).
   05 Openings: at one cell each side of opening.
   06 Expansion / Control Joints: at one cell each side of joint.
   07 Refer to Structural Drawings for additional information.

E. CMU Lintels: Refer to structural Drawings.
   01 Lintels shall extend a minimum of 8” beyond openings and tied to vertical cell reinforcing at jambs.

F. CMU Bond Beams:
   01 Provide continuous CMU bond beams at top of, or last full accessible course of all CMU walls.
   02 On walls heights 14’ or taller, provide a bond beam at the mid-point of the wall.
   03 Bond beam reinforcing shall be as described for CMU lintels above.
   04 Bond beams shall be tied to vertical cell reinforcing.
   05 Refer to Structural Drawings for mechanical linkage between CMU walls and steel structure.

2.6 MASONRY CLEANING AND PROTECTION

A. Masonry Cleaning Products:
   01 Cleaning materials for the purpose of removing excess mortar, job dirt and normal job stains from light colored brick and tile units which are not subject to metallic stains shall be Sure Klean® 600 Detergent manufactured by Prosoco; or approved equal.
      a. Specific Gravity: 1.117
      b. pH: 0.3 (1:6 dilution)

c. Flash Point: None
d. Freeze Point: -30°F (-34.4°C)
e. Weight/Gal.: 9.3 lbs

02 Cleaning materials for purposes of removing excess mortar, job dirt and normal job stains from brick and tile units which are subject to metallic oxidation stains shall be Sure Klean® Vana Trol® manufactured by Prosoco Co.; or approved equal.
a. Specific Gravity: 1.117
b. pH: 0.3 (1:6 dilution)
c. Flash Point: None
d. Freeze Point: -30°F (-34.4°C)
e. Weight/Gal.: 9.3 lbs

03 Cleaning material for removal of excess mortar and job dirt from brick, concrete, tile and stone surfaces shall be Enviro Klean® Mortar & Grout Remover manufactured by Prosoco Co.; or approved equal.
a. Flash Point: None
b. Specific Gravity: 1.00
c. pH: 1.6 (Dilute 1 pound of powder to 1 gallon of water.)

04 Consult brick supplier/manufacturer to confirm proper selection of cleaning detergent to minimize reaction from metallic or other mineral deposits.

B. Masonry Water Repellant Sealant:
01 Design is based on Prosoco Sure Klean® Weather Seal Siloxane PD.
a. Solids: 4.0% ASTM D5095
b. Specific gravity: 0.996
c. Flash point: > 212 degrees f per ASTM D3278
d. VOC: <30 grams/liter

02 Water Absorption Reduction Rates:
a. Mortar: 98% minimum per ASTM D6532
b. Brick: 89% minimum per ASTM C67
c. CMU: 95% minimum ASTM C140

PART 3 - EXECUTION

3.1 PREPARATION OF MATERIALS

A. Concrete Masonry Units
01 Lay out CMU to coordinate with reinforcing dowels in slab, centered in CMU vertical cells.
02 Where cutting is required, masonry shall be cut with a sharp masonry saw.
03 Lay out split face masonry to yield a generally uniform appearance, without extreme variations from unit to unit.
04 Lay out CMU to eliminate installation of small cuts as much as practical.

B. Brickwork:
01 Dampen brick before laying in a manner consistent with the nature of the brick, the mortar, and the weather conditions.
02 Lay out masonry to eliminate installation of small cuts as much as practical.

C. Mortar and Grout:
01 Use suitable containers for material measurement (i.e. metal or wood cubic foot box, graduated bucket, etc.). Measuring sand with a shovel is not acceptable.
02 Mix a minimum of 5 minutes.
03 Consistency will completely fill all spaces intended to receive grout.

04 Use within 2-1/2 hours of initial mixing.
05 Mortar or grout shall not be used if curing has progressed to yield a stiff consistency or flash set.

D. Reinforcement:
01 Reinforcement shall be free from lose rust and other coatings that would reduce the bond.
02 Cut accurately to length and bend by such methods as will prevent injury to the material.

E. Straighten out kinks or bends.

3.2 ALLOWABLE TOLERANCES

A. Maximum Variation from Plumb:
01 In lines and surfaces of columns, walls and at rises:
a. 1/4" in 10' (1:480)
b. 3/8" in 20' (maximum)
c. 1/2" in 40' (1:960)
02 For external corners, expansion joints and other conspicuous lines:
a. 1/4" in 20' (maximum)
b. 1/2" in 40' (1:960)

B. Maximum variation from level:
01 1/4" in any 20' (1:480)
02 1/2" in any 40' (1:960)

3.3 INSTALLATION

A. Contractor shall use all means necessary to ensure all masonry work is adequately braced at all times during erection.

B. General:
01 Do not use chipped brick or chipped block where exposed to view.
02 Use masonry saws to cut and fit exposed units.
03 Lay units plumb, true to line, and with level courses accurately spaced within allowable tolerances.
04 Do not furrow bed joints.
05 Stop off horizontal run by racking back in each course; toothing is not permitted.
06 Adjust units to final position while mortar is soft and plastic.
07 If units are displaced after mortar has stiffened, remove, clean joints and units and re-lay with fresh motor.
08 When joining fresh masonry to set or partially set masonry:
a. Remove loose masonry units and mortar.
b. Clean and lightly wet exposed surface of set masonry prior to laying fresh mortar.

C. Metal Door Frames Anchored to Masonry: Fill jamb frames solid with mortar as Work progresses. Install masonry anchors, securing to frame and adjacent vertical reinforcement. Fill head frame solid with mortar prior to installing lintel units.

D. Lintels and Bond Beams: Provide reinforced unit type, except where steel lintels are shown. Use reinforcing bars as shown on the Drawings. Completely fill lintels and bond beams with pea-gravel concrete. Provide 8-inch bearing at end of lintels.

E. Partitions Tops: Allow space at top of horizontal spanning walls for compressible joint back-up and sealant as specified in Section 07 92 00 – Joint Sealants. Anchor top of walls to deck or structure.

F. Brick Ledge and Through Wall Flashing:
   01 Clean surface of masonry smooth and free from projections which might puncture or otherwise damage flashing material.
   02 Place through-wall flashing on bed of mortar and cover with mortar.

G. Mortar Beds:
   01 Place mortar in a manner which will result in the development of adequate bond between the masonry and the reinforcement.
   02 Lay units with full mortar coverage on horizontal and vertical / head joints in all courses.
   03 Provide sufficient mortar on ends of masonry unit to fill head joints.
   04 Rock closures into place with head joints thrown against two adjacent masonry units in place.
   05 Do not pound corners or jambs to fit stretcher units after setting in place.
   06 Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.

H. Weepholes:
   01 Provide weepholes in head joints in course immediately above all thru-wall and self-adhered flashing at all exterior brick walls.
   02 Leave head joint free and clean of mortar.
   03 Spacing:
      a. Modular Brick and Stone: 24-inch O.C. maximum.
      b. King Size Brick: 30-inch O.C. maximum.
      c. CMU: 32-inch O.C. maximum.
   04 Keep weepholes and area at flashing free of mortar droppings.
   05 Install weep hole inserts at all weep hole head joints.

I. Cavity:
   01 The level to which brick cavities shall be free of excess mortar shall be as established and approved on the masonry mock-up wall. Keep masonry cavity clean and free of excess mortar.
   02 Carefully lay first course at brick ledge and lintels, making sure that cavity is clean of all excess mortar which may impede the flow of moisture through weep holes.
   03 As work progresses, trowel and remove all protruding fins in cavity flat on inner surface of the wythe brick cavity.
   04 Take all necessary precaution to not allow excess mortar to drop within cavity from the inner surface of the wythe.
      a. Use wood strips with attached wire pulls or other suitable means to collect all loose mortar below the course being laid.
      b. Remove all mortar and clean the device at regular intervals while mortar is still elastic and able to be removed without disturbing masonry already laid above it.
   05 Cavities shall be inspected and excess mortar within the masonry cavity shall be grounds for removal and replacement of masonry if no other practical means is available to remove excess mortar; all at contractor's expense.

J. Mortar Joints and Patterns:
   01 Refer to Drawings for accent coursing.
   02 Lay brick in one-third running bond pattern in general.
   03 Provide soldier coursing, rowlock courses and other patterns as indicated on the Drawings

04 Lay standard CMU in one-half running bond pattern.
05 Provide flush joints where concealed from view and where dampproofing is scheduled.
06 Provide standard concave tooled joint where masonry is exposed to view for brick and CMU, typically. Provide recessed accent joints in brick where indicated on elevations.
07 All mortar joints to be of consistent size.
08 Refer to the Drawings for paver patterns.

K. Reinforcement/Tie Systems:
01 Completely embedded in mortar or grout.
02 All reinforcement consisting of bars or wire 1/4 inch or less in diameter, embedded in the horizontal mortar joints, shall have no less than 5/8 inch mortar coverage from the exposed face.
03 Truss reinforcing within each wythe shall be at 16-inch O.C. vertically for exterior wythes and back-up wythes, whether detailed or not.
04 Veneer anchors at sheathing covered metal stud exterior walls shall be attached on outside face of sheathing using cadmium plated sheet metal screws. Spacing shall be 16-inch O.C. horizontally and 16-inch O.C. vertically.
05 Veneer anchors at Interior brick walls with metal stud back up shall be the same as Item 04 above, except anchors shall be attached directly to metal stud with cadmium plated sheet metal screws.
06 At intersection of all perpendicular masonry walls provide two vertical rows of corrugated wall ties at 16-inch O.C. vertically (7/8" wide x 16-gauge galvanized steel).
07 In cavity walls with CMU back up, embed truss type horizontal reinforcement with integral wall ties every 16 inches O.C. vertically.
08 Splices in reinforcement: Splices may be made only at such points and in such manner that the structural strength of the member will not be reduced. Lapped splices shall be 8 inches. Welded or mechanical connection shall develop the strength of the reinforcement.
09 Corrugated strap ties shall not be used as veneer anchors.
10 Place joint reinforcement in the first two bed joints above and the first two bed joints below masonry openings.
11 Provide masonry ties at floor and roof decks as indicated.

L. Corners: Connect corners with No. 9 galvanized wire or corrugated tie using one tie for each 4 inches of nominal wall thickness.

M. Masonry Joints: Expansion Joints/Control Joints:
01 The mortar joint which stops at the expansion joint cavity shall be struck flush with the masonry unit, producing a continuous flat surface for the sealant to adhere to.
02 Place masonry control joints and expansion joints as indicated on the Drawings. If not indicated, place joints at 20’-0” O.C. maximum and at each side of openings. Coordinate with Architect for exact locations.
03 Provide CMU control joints directly over concrete slab control joints. Whenever possible, lay out CMU so that control joint will coincide with CMU module (20’ maximum spacing between control joints).
04 Provide masonry joints at structural columns to isolate movement from continuing or intersecting walls and columns.

N. Sealant Joints:
01 Allow for sealant joints around outside perimeters of exterior doors, window frames and other wall openings.
02 Uniform depth: 3/4 inch
03 Uniform width: not less than 1/4 inch and not more than 1/2 inch.

04 Provide sample for Architect's approval.
05 Refer to drawings for locations and details of accent joints.

O. Mortar Deflector:
01 Provide in continuous lengths at base of all masonry installations including brick ledges, lintels and similar conditions where weep holes are present.
02 Install in accordance with manufacturer's standards and requirements.

3.4 CLEANING

A. At completion of the Work, fill and retool holes in joints of exposed masonry surfaces with mortar.

B. After pointing has set and hardened, clean exposed masonry surfaces with cleaning agent recommended for each type of masonry used.

C. Leave masonry clean, free of mortar daubs and with tight mortar joint throughout.

D. After brickwork is set, protect all edges and corners from damage.

E. The cleaning shall be in accordance with manufacturers printed instructions for type of cleaning agent used.
01 Use a stiff brush where possible for all cleaning.
02 If a pressure washer is required, use pressure at 300 PSI or less as required to prevent damage of any kind to masonry (i.e. chipping units or mortar, removing brick texture, etc.).
03 Keep tip a minimum of 24" from face of wall being cleaned.

3.5 MASONRY WATER REPELLANT SEALER

A. Upon completion of cleaning all masonry surfaces, apply the masonry water repellant sealant material to all masonry surfaces using a low pressure.

B. Application: Before applying, read "Protect" and "Precautionary Measures" sections in the Manufacturer's Product Data Sheet for Weather Seal Siloxane PD. Refer to the Product Data Sheet for additional information about application of Weather Seal Siloxane PD. Do not dilute or alter.

C. Vertical Application Instructions:
01 For best results, apply protective treatment "wet-on-wet" to a visibly dry and absorbent surface.
02 Alternate Application Methods:
a. Spray: Saturate from the bottom up, creating a 4" to 8" (15 to 20 cm) rundown below the spray contact point. Let the first application penetrate for 5-10 minutes. Re-saturate. Less will be needed for the second application.
b. Brush or roller: Saturate uniformly. Let protective treatment penetrate for 5 to 10 minutes. Brush out heavy runs and drips that don't penetrate.
c. Dense Surface Application Instructions: Apply in a single, saturating application with no run down. Back roll all runs and drips to ensure uniform appearance. DO NOT OVER APPLY. One application is normally enough. Always test.
03 Horizontal Application Instructions:
a. Saturate in a single application. Use enough to keep the surface wet for 2 to 3 minutes before penetration.

b. Brush out puddles until they soak in. Treated surfaces dry to touch in 1 hour.
c. Protect surfaces from rainfall for 6 hours following treatment. Many surfaces need several days to develop full water repellency.

3.6 PROTECTION

A. Cover over all unfinished work at night against the elements with plastic sheet, building paper, heavy canvas or other material approved by Architect to prevent water from entering masonry cavities.

B. Upon completion of masonry work, use all means necessary to protect the masonry installation from damage. If damaged, immediately make all repairs and / or replacements.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: The structural framing plans and details indicate general framing required. Other structural steel components and assemblies are indicated on other (non-S) sheets. In addition to work / materials indicated on the structural sheets, Work of this Section shall also include, but not be limited to the following:
   01 Loose lintels.
   02 Framed openings in floor and / or roofs for installation of equipment and other "through" work.
   03 Suspension framing for structurally supported masonry lintels.
   04 Flat plate / angle required for masonry supported directly on steel framing.
   05 Sleeves for embedded work.
   06 Other structural shapes / components described in other Division 5 Specification Sections.

C. Related Work:
   01 Section 05 12 13 – Architecturally Exposed Structural Steel Framing
   02 Section 05 21 00 – Steel Joist Framing
   03 Section 05 31 00 – Steel Decking
   04 Section 05 41 00 – Structural Metal Stud Framing
   05 Section 05 50 00 – Metal Fabrications
   06 Section 05 51 00 – Metal Stairs
   07 Section 05 51 33.23 – Alternating Tread Ladders
   08 Section 05 52 13 – Pipe and Tube Railing
   09 Section 05 52 16 – Decorative Handrail System
   10 Section 10 22 26.13 – Operable Partictions

D. Contractor / fabricator shall verify all conditions and requirements for structural steel as required for a complete project as indicated on the Contract Documents.
   01 All required work shall be included in the Base Proposal amount.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Certifications:
      a. Material Certifications: Documentation certifying with grade compliance of specified structural steel components.
      b. Domestic Source: Documentation certifying source / origin of structural steel components proposed to be furnished.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and location of structural steel members.
   02 Details and schedules for fabricating and assembly of structural steel. Include details of cuts, connections, camber, holes, and other pertinent data.
   03 Indicate welds by Standard AWS symbols and show size, length and type of each weld.
   04 Show profiles, sizes, spacing, and locations of shop fabricated components and assemblies.
   05 Show details of shop fabrications, connections and details.
   06 Show details of field erection fabrications, connections and details.
   07 Provide calculations demonstrating compliance with wind load and other requirements.
   08 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation / erection instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

1.3 REFERENCES

A. American Society for Testing and Materials:
   01 ASTM A36 – Structural Steel.
   02 ASTM A123 / A123M – Standard Specifications for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
   03 ASTM A153 / A153M – Standard Specifications for Zinc (Hot-Dip) on Iron and Hardware.
   04 ASTM A307 – Carbon Steel Externally and Internally Threaded Standard fasteners.
   05 ASTM A385 – Providing High-Quality Zinc Coating (Hot Dip).
   06 ASTM A325 – High Strength Bolts for Structural Steel.
   07 ASTM A500 – Cold formed welded and seamless carbon sheet structural tubing in rounds and shapes.
   08 ASTM A992 – Steel for Structural Shapes for use in Building Framing.

B. Federal Specification: Fed. Spec. TT-P-664 and MIL-P-53030.

C. American Institute for Steel Construction:
   01 Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings - Latest Edition.
   02 Code of Standard Practice - Latest Edition.

D. American Welding Society: American Welding Society Structural Welding Code D11.1-77.

E. American Iron and Steel Institute Specification for Design Fabricated and Erection of Cold Formed Steel.

1.4 QUALITY ASSURANCE

A. Testing Laboratory Services:
   01 Test results shall meet or exceed established standards.
   02 Testing Lab shall inspect erected steel prior to cover-up to verify conformance with the specified requirements.

03 Work to be inspected shall include, but not necessarily limited to the following:
   a. Welds at bar joists prior to installation of decking.
   b. Welds / connection of decking to structural components.
   c. Moment connections.
   d. Random torque testing of bolted connections.

B. Building / Construction Components: Meet or exceed established standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Structural Steel: All structural steel shall be produced domestically in the United States.
   01 Deviations from this requirement, if any, shall be clearly stated in the submittals; including origin of non-US produced steel.

B. Non-Shrink Grout: Design of non-shrink grout is based on products manufactured by Master Builders Solutions / BASF.

C. Non-Shrink Grout Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section provided proposed materials meet or exceed all specified requirements:
   01 Gifford Hill
   02 Hallemite
   03 Sika Chemicals

2.2 MATERIALS

A. Structural Steel:
   01 Comply with ASTM A992.
   02 Plates, angles, and channels shall comply to ASTM A36.
   03 Steel Tubes shall comply with ASTM A500 - Grade B (Fy= 46 KSI).

B. Welding: Shall conform to the American Welding Society (AWS) standards and recommendations.

C. Bolts:
   01 Comply with ASTM A307, standard bolt and ASTM A325N automatic shearing high strength bolts.
   02 Size: 3/4" or as shown on Drawings.

D. Shop Painting:
   01 Comply with Fed. Spec. TT-P-636.
   02 Preparation: Steel shall be clean, dry, and free of rust.
   03 Shop-coat all items except galvanized members and members to receive sprayed-on fireproofing. Coordinate as required.

E. Galvanized Metal:
   01 Comply with ASTM A123 / ASTM 123M.
   02 General: Galvanize all steel sections which are fully or partially exposed to weather, regardless if they are scheduled to receive a finish coat of paint or not.
   03 Do not apply silicone protective coating to galvanized steel.

F. Design of Non-Shrink Grout is based on Master Builders Solutions / BASF MasterFlow 885 High-Precision Non-Shrink Grout.
   01 Provide below all column base plates; and other locations where indicated on the Drawings.
   02 Properties at 28 days:
      a. Compressive Strength: 9,000 PSI minimum
      b. Volume Change: 0.08% (ASTM C-1107)
      c. Flexural Strength: 1,150 PSI
      d. Punching Shear Strength: 2,600 PSI

G. Loose Lintels: Unless shown otherwise on the Drawings, provide steel angle lintels bearing 8” each side beyond all masonry openings in the following sizes:
   01 0” to less than 5’-0” 3-1/2 x 3-1/2 x 5/16
   02 5’-0” to less than 6’-0” 5 x 3-1/2 x 5/16 LLV
   03 6’-0” to less than 8’-0” 6 x 3-1/2 x 5/16 LLV
   04 8’-0” to 10’-0” 7 x 4 x 3/8 LLV
   05 Lintels for openings wider than 10’-0” shall be structurally suspended as indicated on the Drawings.
      a. If not specifically shown, provide a 4 x 3-1/2 x 5/16” (LLV) lintel angle with 3 x 3 x 1/4" vertical and diagonal angle supports at 48” O.C. maximum suspended and anchored to structure above.

PART 3 - EXECUTION

3.1 FABRICATION

A. Conform to applicable requirements of "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" issued by the American Institute for Steel Construction.

B. Fabricate structural members in continuous lengths, unless indicated otherwise on the Drawings.

C. All shop fabricated assemblies shall be shop welded.
   01 Provide minimum 1/4" continuous fillet welds unless indicated otherwise on the Drawings.
   02 Coordinate shop fabricated assembly connections to be made in the field.

D. Size column base plates as required to be concealed in finished Work. Coordinate with other trades as required.

E. Galvanizing:
   01 All structural steel exposed directly to the outside environment shall be galvanized.
   02 Additionally, provide galvanized steel as indicated on the Drawings.
   03 All steel to be galvanized shall be hot-dipped galvanized after fabrication is complete.

3.2 ERECTION

A. Conform to applicable requirements of "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" issued by the American Institute for Steel Construction.

B. Provide steel shims or double nut connection at column base plates as required to achieve correct elevations.

C. All beam-to-column, beam-to-beam and similar field connections shall be bolted unless indicated otherwise on the Drawings.

D. Provide temporary bracing and / or tension cables as required to plumb and level structural steel framing.
   01 Leave temporary measures in place until structural steel is loaded (i.e. upper floors poured and cured, all joist bracing is installed, roof deck installed and cured).
   02 Upon removal, verify that all structural steel is plumb and level to elevations indicated on the Drawings.

E. Miscellaneous Steel:
   01 Miscellaneous steel includes, but is not limited to joist bracing, suspended lintels and similar assemblies, floor and roof edge angles, and similar non-primary steel components and assemblies.
   02 All miscellaneous steel shall be welded in place unless otherwise indicated on the Drawings.

F. Touch up field connections and other damaged areas in shop coat as erection proceeds. Use same material as shop coat.

G. Grout solid under base plates to required elevations. Allow grout to cure prior to filling column recesses with concrete.

END OF SECTION

SECTION 05 21 00

STEEL JOIST FRAMING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide open web steel joists as indicated on the Drawings.
   02 Provide joist girders as indicated on the Drawings.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 31 00 – Steel Decking
   03 Section 05 50 00 – Metal Fabrications
   04 Section 07 81 16 – Cementitious Fireproofing
   05 Section 07 81 23 – Intumescent Fireproofing

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with structural loads, wind loads and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

1.3 REFERENCES

A. ASTM International:
   01 ASTM A36 / A36M – Standard Specification for Carbon Structural Steel.
   02 ASTM A153 / A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

03 ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
04 ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.
05 ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
06 ASTM F436 – Standard Specification for Hardened Steel Washers.
07 ASTM F568M – Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners.

B. American Institute of Steel Construction (AISC):
01 AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

C. Steel Joist Institute (SJI):
01 Steel Joist Institute (SJI) – Standard Specifications, Load Tables & Weight Tables for Steel Joists and Joist Girders.
02 SJI – Code of Standard Practice.

D. American Welding Society (AWS):
01 AWS D1.1 – Structural Welding Code – Steel.

E. Federal Specification: Fed. Spec. TT-P-664 and MIL-P-53030.

F. American Iron & Steel Institute – Design of Cold-formed Steel Structural Members.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member of the Steel Joist Institute who regularly produces steel joists of the K, LH, or DLH Series, or joist girders conforming to SJI's Specifications and Load Tables and whose designs have been checked and accepted by the Steel Joist Institute.

B. Design connections under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

C. Perform Work in accordance with SJI, Standard Specification, Code of Standard Practice, Load Tables, and Weight Tables, including headers and other supplementary framing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer of steel joists shall be a member of the Steel Joist Institute.

B. The following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements.
01 New Milennium Building Systems
02 Seyco Joist Company
03 Vulcraft

2.2 MATERIALS

A. Provide Steel Joists in conformance with SJI - Standard Specifications, Load Tables & Weight Tables for Steel Joists and Joist Girders.

B. Open Web Joists Members, SJI Type, including the following as indicated on the Drawings:
   01 Open Web Steel Joists (K Series).
   02 Longspan Steel Joists (LH Series).
   03 Deep Longspan Steel Joists (DLH Series).
   04 Joist Girders.
   05 Composite Joist (CJ Series).

C. Bridging: Provide bridging of material, size, and type required by SJI Standard Specifications for type of joist, chord size, spacing, and span.

D. Furnish ceiling extensions, where indicated on the Drawings, either extended bottom-chord elements or a separate extension unit to support ceiling construction load indicated on the Drawings. Extend ends to within 1 inch (25 mm) of finished wall surface unless otherwise indicated.

E. Carbon-Steel Bolts and Threaded Fasteners: ASTM A307, Grade A (ASTM F568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
   01 Finish: Plain, uncoated at joists contained within the building envelope.
   02 Finish: Hot-dip zinc coating, ASTM A153 / A153M, Class C at exterior joists indicated to be galvanized.

F. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.
   01 Finish: Plain, uncoated at joists contained within the building envelope.
   02 Finish: Hot-dip zinc coating, ASTM A153 / A153M, Class C at exterior joists indicated to be galvanized.

G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Finish:
   01 Steel joists and joist girders shall be properly cleaned and primed with one coat of manufacturer's standard shop primer in accordance with the SJI Standard Specifications.

2.3 FABRICATION

A. Open Web Steel Joists:
   01 Top Chords and Bottom Chords: Angles or tees.
   02 End Bearing: Double angles or C-sections.
   03 Bearing Point: Flat bearing surface unless shown otherwise on the Drawings.
   04 Provide joist seat extensions as indicated on the Drawings and as required to properly interface with adjacent work.

B. Bridging:
   01 Provide horizontal bridging as indicated on the Drawings and in accordance with Standards of the Steel Joist Institute.
   02 Anchorage: weld bridging to each joist at each contact point with bottom chord and at spandrel members.
   03 As recommended by joist manufacturer.

C. Design and fabricate steel joist with camber as required to accommodate the imposed dead loads.

D. Shop Painting:
   01 Comply with Fed. Spec. TT-P-636.
   02 Preparation of Steel: Clean, dry free of rust, and mill scale.
   03 After Erection: Immediately touch up scratched and welds with paint equal to shop coat.
   04 Do not shop prime joists to receive direct application of cementitious fireproofing.

PART 3 - EXECUTION

3.1 ERECTION

A. All erection procedures shall comply with Steel Joist Institute's "Code of Standard Practice," unless otherwise indicated or specified.

B. All joist shall be installed parallel and square in configurations as indicated on the Drawings.

C. Coordinate with other trades as required to facilitate angle framed openings through bar joists.

D. Touch up field connections and other damaged areas in shop coat as erection proceeds. Use same material as shop coat.

E. Shop tags shall be removed prior to completion of the project.

F. Coat surfaces to be in contact with mortar, masonry or aluminum using a bituminous coating.

3.2 NOTIFICATION

A. Notify Architect and testing laboratory after all structural steel welds are completed.

END OF SECTION

SECTION 05 31 00

STEEL DECKING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Steel deck for floor and roof.
   02 Welding and accessories for metal deck.
   03 Cutting openings and reinforcing for openings 18 inches and smaller in any dimension.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 21 00 – Steel Joist Framing
   03 Section 05 50 00 – Metal Fabrications

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Detailed Drawings showing layout of form sheets, anchorage details, supplementary framing, openings, special jointing or other accessories.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

1.3 REFERENCES

A. American Iron and Steel Institute (AISI):
   01 North American Specification for the Design of Light Gauge Structural Members.

B. Steel Deck Institute (SDI):
   01 Design Manual for Composite Decks, Floor Decks and Roof Decks.
   02 SDI Standards.

C. ASTM International:
   01 ASTM A36 – Standard Specification for Structural Steel.
   02 ASTM A653 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   03 ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   04 ASTM A924 / A924M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   05 ASTM A1008 / A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

D. American welding Society (AWS):
   01 AWS D1.3 – Structural Welding Code – Sheet Metal.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member in good standing of Steel Deck Institute (SDI).

B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's North American Specification for the Design of Cold-Formed Steel Structural Members and SDI RDDM Roof Deck Design Manual.

C. Roof Decking:
   01 Deck shall meet the minimum design gauge and yield strength specified on the Drawings or meet minimum specified Section properties at specified yield strength.
   02 Whenever possible, the deck shall be multi-span.

D. Welding: Qualify procedures and personnel according to AWS D1.3, Structural Welding Code - Sheet Steel.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are acceptable to provide products of this Section:
   01 CSM Metal Deck
   02 A.C.T. Metal deck Supply
   03 New Millennium Building Systems
   04 Oates Metal Deck and Building Products
   05 Vulcraft
   06 Whitaker Metal Deck Sales

2.2 MATERIALS

A. Refer to Structural Drawings for roof decking profiles, locations and properties.

B. Steel Roof Deck - General: Fabricate deck to comply with SDI RD - Standard for Steel Roof Deck, with the minimum section properties indicated. Deck type and thickness shall be as indicated on the Drawings.

C. Design properties shall be computed in strict accordance with "Specifications for the Design of Light Gauge Structural Members", as published by the American Iron and Steel Institute, and Steel Deck Institute Standards.

D. Provide steel deck cut to required lengths where ever practical.

E. Steel deck shall meet the following finish requirements:
   01 All decks shall be galvanized to conform to ASTM A446.
   02 Steel roof deck and supporting members shall be retouched where shop coat has been damaged due to placing, handling or welding.
   03 Provide vented steel deck at all areas to receive insulating concrete fill.

2.3 ACCESSORIES

A. Manufacturer shall supply all ridge and valley plates, cant strips, sump pans and other accessories which must be attached directly to the steel form in order to provide finished surface for application of fill, roofing accessories and roofing.
   01 Coordinate with other trades as required for exact conditions and requirements.

B. Column closures, end closures, side closures and cover plates shall be the standard type provided by the deck manufacturer unless indicated otherwise on the Drawings.

C. Galvanizing Repair Paint for Roof Decks: High-zinc-dust content paint for re-galvanizing welds in galvanized steel conforming to ASTM A780.

D. Fasteners: As manufactured by Hilti, Buildex, Simpson Strong-Tie or approved equal.

E. Flexible Closure Strips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not install roof deck until supporting construction is in place.

B. Examine support framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work of this Section.

C. If supporting construction is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Locate deck bundles to prevent overloading of support members.

3.3 INSTALLATION - GENERAL

A. Install deck panels and accessories in accordance with the Contract Documents approved Installation Drawings and requirements of this Section.

B. Place deck panels on structural supports and adjust to final position with ends aligned. Attach firmly to the supports immediately after placement in order to form a safe working platform.

C. Cut and neatly fit deck units and accessories around openings and other work projecting through or adjacent to the decking.

D. Trades that subsequently cut unscheduled openings through the deck are responsible for reinforcing the openings.

3.4 INSTALLATION - ROOF DECK

A. Install and fasten deck and accessories in accordance with the Contract Documents, approved Installation Drawings and requirements of ANSI/SDI RD.

B. End Bearing: Install deck ends over supports with a minimum end bearing of 1-1/2 inches (38 mm) unless otherwise shown on approved Installation Drawings.

C. Side Closures: Fasten to supporting structure and deck in accordance with the Contract Documents, approved Installation Drawings and requirements of ANSI/SDI RD.

D. Ridge and valley plates, flat plates at changes of deck direction and sump pans, shall be fastened to the deck in accordance with the Contract Documents, approved Installation Drawings and requirements of ANSI/SDI RD.

3.5 INSPECTION AND REPAIR

A. Before roof insulation placement, the deck shall be inspected for tears, dents, or other damage that may prevent the deck from acting as a tight and substantial form. Replace decking which has been damaged or permanently deflected.

B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint.

C. Repair Painting: Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

3.6 PROTECTION

A. Protect installed products until completion of Project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05 41 00

STRUCTURAL METAL STUD FRAMING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Light gauge steel framing at all exterior walls, and exterior envelope.
   02 Light gauge structural steel framing at interior locations as indicated on the Drawings.
   03 All comments within this specification section shall be adhered to and included in the design by the manufacturer’s Texas registered engineer.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 05 12 00 – Structural Steel Framing
   03 Section 05 21 00 – Steel Joist Framing
   04 Section 05 31 00 – Steel Decking
   05 Section 06 10 00 – Rough Carpentry
   06 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Provide all submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data: Manufacturer's specifications and other data for all products proposed to be furnished as needed to demonstrate compliance with specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies based off provided contract documents.
   01 Show profiles, sizes, spacing and locations of framing components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Drawings shall depict all conditions of the building envelope.
   05 Include framing and connection details for all envelope wall conditions (i.e. field of walls, rough openings, and special conditions); complete with fastener size, quantity and installation patterns.
   06 If proposed, clearly indicate proposed adjustments to member sizes as indicated on the Drawings; however, such adjustment shall not deviate to a less gauge or less stringent spacing than what is specified.
   07 Provide calculations demonstrating compliance with wind load and other requirements.
   08 Shop drawings shall be sealed and signed by a Texas registered engineer.
   09 All comments within this specification section shall be adhered to and included in the design by the Texas registered engineer.

D. Manufacturer's installation instructions for all components and assemblies based off provided contract documents.

E. Sample Panel: Sample panel shall be 8' long x 6' high panel showing completed exterior light gauge steel framing assembly, complete with exterior sheathing, dampproofing and rigid insulation (where applicable).
   01 Assembly shall include a framed opening.
   02 Coordinate as required with other trades. Refer to Section 04 20 00 – Unit Masonry for additional information.

1.3 QUALITY ASSURANCE AND REFERENCES

A. All materials proposed to be furnished shall comply with the following:
   01 AISI – Specification for the Design of Cold-Formed Steel Structural Members. Latest edition and amendments.
   02 ASTM C955 – Standard specification for load bearing (transverse and axial) steel studs, runners (tracks), bracing and bridging for screw application of gypsum board metal plaster bases.
   03 ASTM A653 – Steel Sheet, Zinc Coated (galvanized) by the Hot-Dip Process, Structural Quality.
   04 ASTM A924 – Steel Sheet, Metallic Coated by the Hot-Dip Process, General Requirements.
   05 ASTM A570 – Hot-Rolled Carbon Steel Sheets and Strip, Structural Quality.
   06 ASTM A611 – Steel, Cold-Rolled Sheet, Carbon, Structural.
   07 MLSFA: Steel Framing Manual.
   08 Welding Qualifications: Quality welding processes and welding operations in accordance with AWS "Standard Qualification Procedure".

B. The Drawings depict general light gauge steel framing configurations and requirements; and is presumed adequate to permit compliance with the specified performance requirements.

C. Specific design in compliance with this Specification is the responsibility of the light gauge metal framing provider; including, but not limited to:
   01 Member sizes.
   02 Material thicknesses.
   03 Methods and detail of attachment.
   04 Bracing / bridging.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design of light gauge steel framing is based on products manufactured by ClarkDietrich.

B. The following manufacturers are acceptable to provide products of this Section provided all proposed products meet or exceed specified requirements:
   01 Cemco
   02 Marino/Ware
   03 Mill Steel
   04 The Steel Network
   05 Telling Industries

2.2 MATERIALS

A. Light Gauge Steel Framing:
   01 Steel Studs: Manufacturer's standard C-shaped steel studs, punched with stiffened flanges, complying with ASTM C995.
   02 Punched web with minimum 1 5/8" flanges with 1/2" inch flange return lip.
   03 Steel Track: Manufacturer's standard U-shaped steel track, unpunched, with unstiffened 1-1/4" flanges, complying with ASTM C955.
   04 Steel Deflection / Top Track: Manufacturer's standard 16 gauge deep-leg U-shaped steel track, unpunched, with unstiffened 2-inch flanges. Flanges may be slotted to accommodate movement in the stud-to-top-track connection.

B. Provide steel framing accessories of the same material and finish used for framing members, Grade 33.
   01 Accessories include bracing, bridging, blocking, gusset plates, diagonal strap bracing, kicker and knee braces indicated, or required to provide a complete steel framing system to withstand design loads indicated on the Structural Drawings.

C. Minimum thickness for any / all light gauge steel framing shall be 54 mil, ASTM A653/A653M, Grade A, 33,000 psi minimum yield (FY).

D. Minimum member size for general framing shall be 6"; unless specifically shown otherwise on the Drawings or required per reviewed Shop Drawings.

E. Minimum Material Thicknesses / Mils for Uncoated Steel:
   01 16 gauge: 54 Mil
   02 14 gauge: 68 Mil
   03 12 gauge: 97 Mil

F. Light Gauge Steel Framing Properties: The following table lists minimum criteria for various member sizes and thicknesses:

	Stud Size	Stud Mil	Min Sx
01	2-1/2"	54	0.306
02	2-1/2	68	0.372
03	3-5/8"	54	0.485
04	3-5/8"	68	0.610

Note: above only allowed at structural infill, furring and other locations specifically shown on the Drawings.

05	6"	54	0.953
06	6"	68	1.18
07	8"	54	1.43
08	8"	68	1.77
09	10"	54	1.99
10	10"	68	2.47
11	12"	54	2.62
12	12"	68	3.25

G. Gauge equivalent products shall not be accepted – no exceptions.

H. Light Gauge Steel Framing Properties: The following table lists maximum laterally-unbraced heights for exterior wall framing members spaced 16” O.C. and a maximum deflection of L/360:

	Stud Size	Stud Mil	Max UB Ht.	ClarkDietrich No.
01	6”	54	17’-6”	600S162-54 P
02	6”	68	18’-9”	600S162-68 P
03	8”	54	21’-11”	800S162-54 P
04	8”	68	23’-8”	800S162-68 P
05	10”	54	26’-0”	1000S162-54 P
06	10”	68	28’-2”	1000S162-68 P
07	12”	54	32’-11”	1200S162-54 P
08	12”	68	35’-10”	1200S162-68 P

I. Fastenings:
- 01 Stud-To-Track Fasteners: Self-Drilling Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized ASTM A653 or Dagger-Guard coated.
- 02 Sized and detailed per engineered Shop Drawings.
- 03 Track Anchorage Devices: Power-driven or powder-actuated, drilled expansion bolts; or screws with sleeves; sized and detailed per engineered Shop Drawings.
- 04 Welding: AWS D1.3; sized and detailed per reviewed Shop Drawings.

J. Miscellaneous Materials:
- 01 Provide angle clips, bracing, etc. as required to connect light gauge steel framing to structural steel framing.
- 02 Miscellaneous materials shall be the same gauge, or heavier, as the light gauge steel framing is used on.

K. Finish:
- 01 Provide minimum G60 galvanized coating per ASTM A653 and ASTM C995.
- 02 Touch-up all field welds with inorganic zinc-rich primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install metal framing systems in accordance with the engineered Shop Drawings and calculations, and manufacturer's installation instructions.

B. Fastening of components shall be by means of approved self-drilling screws or welding.
- 01 Screw and welds shall be of sufficient size to ensure strength of connection.
- 02 All welding shall comply with American Welding Society "Specification for Welding Sheet Steel in Structure".
- 03 All light gauge steel studs shall be fastened to the bottom and top track at both the inboard and outboard track flanges.

C. Runner Tracks: Install continuous tracks to match associated light gauge steel framing members.
- 01 Align tracks accurately to layout at base and tops of studs.
- 02 Secure tracks as recommended by stud manufacturer, except do not exceed 24 inches O.C. for screw or power-driven fasteners and shall not exceed 16 inches O.C. for other types of attachment.

D. Unless otherwise shown, space studs a maximum of 16 inches O.C.
   01 Space studs less than 16” O.C. in accordance with reviewed Shop Drawings.

E. At a minimum, install continuous, horizontal bridging at mid-height in walls up to 10 feet high, and at 5'-0" O.C. maximum in walls over 10 feet high.
   01 All bridging shall be welded.

F. Coordinate with other trades as required for proper installation of interfacing work.

3.2 TOLERANCES

A. Install exterior wall framing within 1/4 inch plumb over the full height of the wall.

B. Maintain a straight, true wall within 1/4 inch per 40 linear feet length, non-cumulative.

C. Coordinate exact heights required to accept wood blocking, etc. required for the proper installation and interface with work of other trades.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide miscellaneous metal fabricated materials and assemblies as indicated on the Drawings.
   02 Provide metal fabrications as required to complete all structural steel framing.
   03 Coordinate with other trades as required to provide all necessary metal fabrications required to install and interface with their work.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 31 00 – Steel Decking
   03 Section 05 51 00 – Metal Stairs
   04 Section 05 52 13 – Pipe and Tube Railing
   05 Section 07 95 00 – Expansion Joint Covers
   06 Section 10 10 00 – Miscellaneous Specialties
   07 Section 10 14 53 – Traffic Signage

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements where applicable.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

1.3 REFERENCES

A. ASTM International:
- 01 ASTM A36 – Structural Steel.
- 02 ASTM A123 / A123M – Standard Specifications for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- 03 ASTM A153 / A153M – Standard Specifications for Zinc (Hot-Dip) on Iron and Hardware.
- 04 ASTM A307 – Carbon Steel Externally and Internally Threaded Standard fasteners.
- 05 ASTM A385 – Providing High-Quality Zinc Coating (Hot Dip).
- 06 ASTM A325 – High Strength Bolts for Structural Steel.
- 07 ASTM A500 – Cold formed welded and seamless carbon sheet structural tubing in rounds and shapes.
- 08 ASTM A992 – Steel for Structural Shapes for use in Building Framing.
- 09 ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. American Institute of Steel Construction:
- 01 Steel Construction Manual, 15th Edition.

C. American Welding Society:
- 01 American Welding Society Structural Welding Code D11.1-77.

D. American Iron and Steel Institute:
- 01 Specification for Design Fabricated and Erection of Cold Formed Steel.

E. Federal Specification: Fed. Spec. TT-P-664 and MIL-P-53030.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS

A. Structural Steel: Comply with ASTM A36.

B. Welding: Comply with American Welding Society Code.

C. Bolts:
- 01 Comply with ASTM A307.
- 02 Size: 3/4 inch, unless otherwise noted.
- 03 Bolts used to fasten roof perimeter blocking to steel framing shall be carriage type bolts.

D. Anchors:
- 01 Expansion Bolts:
  - a. Rawl Calk-Ins or Arrow Series 4000, 1/4 inch or less.
  - b. Rawl Multi-Calks - greater than 1/4 inch. Top shall be 1/2 inch below concrete surface.
- 02 Molly Screw Anchors:
  - a. In walls 1/16 - 5/8 inch thick, use "S" length.
  - b. In walls 5/8 -1 1/4 inch thick, use "L" length.
  - c. In walls 1 1/4 - 1 3/4 inches thick, use "XL" length.

E. Shop Priming:
   01 Shop coat any ungalvanized ferrous metal with primer.
   02 Clean iron and metal to be primed of scale, dirt and dust by steel scrapers, wire brushers or sandblasting. Remove oil and grease with petroleum naptha.
   03 Thoroughly work paint into all joints by brush. Overall application of brush or spray coat of red lead primer per Fed. Spec. TT-P-86.
   04 Give any painted built-in portions one field coat of primer on all abraded parts after installation.

F. Galvanized Metal:
   01 Comply with ASTM A123.
   02 General: Galvanized all steel sections which are fully or partially exposed to weather, regardless if they are scheduled to receive a finish coat of paint or not.
   03 Galvanized items to be painted shall be primed as outlined in Section 09 91 00 - Painting and Staining.
   04 Hot-dip galvanized after fabrication.
   05 Silicone protective coating shall not be used at galvanized items scheduled to receive paint.

G. Aluminum:
   01 Extruded sections from alloy 6063-T52, meeting the requirements of ASTM B221. Clear anodized finish samples to be submitted for approval on each item. Submit sample of finish weld.
   02 Custom fabricate as shown on the Drawings. Grind all welds smooth and flush to match adjoining exposed surfaces. Provide cast wall brackets - Julius Blum #376.
   03 All fasteners shall be stainless steel with tamper proof bolts and no pop rivets. Provide flush counter sunk heads.
   04 All pipe rails shall be Schedule 40 and have welded connections with male/female splice connections and have a completely smooth flush finish. All corners and angles shall be custom prefabricated. All splices shall occur at supports.
   05 Exterior rails shall be all welded construction.
   06 Provide clear epoxy coating where aluminum is in direct contact with concrete (only).

2.2 MISCELLANEOUS METAL ITEMS

A. The following is a list of the principal miscellaneous metal items to be furnished under this Section. This list is offered only as a guide and Contractor shall thoroughly check Drawings for other miscellaneous metals.
   01 All steel items exposed to the exterior shall be hot-dip galvanized after fabrication.

B. Fixed Pipe Bollard / Guard Post:
   01 Provide and install 4” Schedule 40 steel pipe bollard / guard post, as detailed on the Drawings.
   02 Provide casting anchors welded to the bollard as indicated on the Drawings.
   03 Hot dip galvanized after fabrication.
   04 Fill with concrete after installation, crowned at top.

C. Removable Pipe Bollard / Guard Post:
   01 Provide a 4” Schedule 40 galvanized steel pipe bollard / guard post with 3/8” welded cap plate, as detailed on the Drawings.
   02 Provide and install 5” Schedule 40 galvanized steel pipe sleeve in as detailed on the Drawings.
   03 Provide casting anchors welded to the bollard sleeve as indicated on the Drawings.

04 Provide 2x2x1/4 x 1-1/2” steel angles on each pipe, positioned to mate at fully installed bollard; angles punched to receive a padlock to prevent removal.
05 Hot dip galvanized after fabrication.

D. Steel Handrails & Brackets:
01 Furnish and install 1-1/2” O.D. Schedule 40 steel pipe rails and handrails in configurations as indicated on the Drawings.
02 Multi component handrail systems shall have welded connections.
03 All exposed open ends shall have welded domed caps.
04 Design of wall brackets is based on Julius Blum # 306 3” offset handrail brackets; or equal approved by the Architect.
05 Maximum handrail bracket spacing shall be 72” unless shown otherwise on Drawings
06 Include all other parts required for finished installation.
07 Handrail assemblies at exterior locations shall be hot-dipped galvanized after fabrication.
08 All work shall be in accordance with ADA and Texas Accessibility Standards.

E. Aluminum Handrails & Brackets:
01 Furnish and install 1-1/2” O.D. 6061-T6 or 6063-T53 aluminum pipe rails and handrails in configurations as indicated on the Drawings.
02 Multi component handrail systems shall have welded connections.
03 Design of wall brackets is based on Julius Blum # 316 aluminum 3” offset handrail bracket; or equal approved by the Architect.
04 Include all other parts required for finished installation.
05 All work shall be in accordance with ADA and Texas Accessibility Standards.

F. Steel Ladders:
01 Provide steel ladders at all roof hatch locations.
02 Fabricate from steel shapes:
a. Stringers: 3/8” x 3” steel plate.
b. Rungs: minimum 1” diameter steel bars; 12” maximum spacing.
c. Anchor stand-off brackets: minimum 3” x 6” x 1/4" steel angles or bent plate; locate one (1) at base of ladder anchored to floor slab; and at maximum 48” O.C. above, anchored to wall.
03 Weld joints and grind smooth.
04 Coordinate with roof hatch provider / installer as required for proper interface.

G. Loose Lintels at Masonry Veneer:
01 Fabricate from steel angles as shown on the Drawings.
02 Refer to Structural Drawings for angle sizes relative to opening widths.
03 Use continuous lengths where ever possible.
04 Hot dip galvanize after fabrication.

H. Masonry Anchors at Steel Columns:
01 Fabricate from 5/16” diameter steel, galvanized after fabrication.
02 Field weld to columns, space not more than 24” O.C. vertically to coincide with horizontal mortar joint elevations.
03 Refer to Structural Drawings.

I. Exterior Cast-In-Place Trench Covers and Frames:
01 Design is based on Balco TSD Series – Diamond Plate.
02 Additional Acceptable Manufacturers:
a. Architectural Art Manufacturing.
b. MM Systems Corp.

03 All aluminum trench cover comprised of an extruded aluminum frame and aluminum cover plate.
04 Aluminum Extrusions: 6063-T%, ASTM B221.
05 Aluminum Plate: 5052-H32, ASTM B209.
06 All surfaces in contact with concrete shall have a factory applied, protective coating.
07 Width: Standard manufacturer's width as indicated on the Drawings.
08 Aluminum Plate:
a. 1/4" up to 6" width.
b. 3/8" up to 16" width.
c. 1/2" in vehicle traffic areas.
09 Fabricate frame and plates to fit trench length indicated on the Drawings.

J. Interior Trench Covers and Frames:
01 Design is based on Balco Series TST interior trench frame and cover suitable for insertion of resilient flooring.
02 Additional Acceptable Manufacturers:
a. Architectural Art Manufacturing.
b. MM Systems Corp.
03 Aluminum plate shall be minimum 1/4 inch thick with a recessed design to accept VCT floor tile.
04 Frame shall be set 1/8 inch above concrete floor so that the finished top is flush with the finished VCT floor.
05 See Exterior Cast-In-Place Trench Covers and Frames for additional information.
06 Additional Acceptable Manufacturers:
a. Architectural Art Manufacturing.
b. MM Systems Corp.

K. Window Frame Head Supports:
01 Construct frame supports for all aluminum entrances and storefront / curtain walls as detailed and required for a rigid assembly of the aluminum framing.
02 Refer to Structural Drawings.
03 Fabricate and install to provide anchoring of 2x treated wood blocking at head of aluminum entrances and storefront / curtain walls.

L. Miscellaneous Angles:
01 Sizes and shapes as detailed.
02 Use specified galvanized steel for angles at exterior conditions.

M. Below and Above-Ceiling Supports:
01 Construct of Unistrut members or as approved by Architect to size and shape required to mount and support the associated equipment or assembly.
02 Coordinate with other trades as required.
03 Suspended assemblies shall be secured to structure above with minimum 1/4" steel rods; threaded as required.
04 All work shall be accurate to +/-1/4".
05 Provide supports complete with fastenings to structure for overhead equipment.

N. Stair Safety Nosings: Balco Type P-300 with abrasive inserts. Color as selected by the Architect from full range of colors.
01 Additional Acceptable Manufacturers:
a. American Safety Tread Co.
b. Safe Metal Co.
c. Wooster Products, Inc.

O. Miscellaneous Items:
   01 Miscellaneous metal items and their related components are not necessarily individually described.
   02 Miscellaneous items not described shall be furnished and installed in accordance with the intent of the Drawings and Specifications, and as required to complete the Work.
   03 Coordinate with other trades as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate all trades as required for proper interface of miscellaneous steel and interfacing work.
   01 Concrete foundations at embedded work.
   02 Blocking in walls for wall mounted work.
   03 Steel supports as required.
   04 Coordination with building finishes.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer’s instructions and final reviewed submittals.

B. Separate all dissimilar metals.

C. Where welding is exposed to view, welds shall be executed neatly then ground smooth. Pits and blemishes are not acceptable.

D. For manufactured items, adhere to printed manufacturer's installation instructions.

E. Refer to Section 09 91 00 – Painting and Re-painting for items that are to receive paint.

END OF SECTION

SECTION 05 51 00

METAL STAIRS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide metal stairs in configuration and locations as indicated on the Drawings.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 50 00 – Metal Fabrications
   03 Section 05 52 13 – Pipe and Tube Railing
   04 Division 9 – Flooring Sections

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

1.3 REFERENCES

A. ASTM International:
   01 ASTM A36 – Structural Steel.
   02 ASTM A123 / A123M – Standard Specifications for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
   03 ASTM A153 / A153M – Standard Specifications for Zinc (Hot-Dip) on Iron and Hardware.
   04 ASTM A307 – Carbon Steel Externally and Internally Threaded Standard fasteners.
   05 ASTM A385 – Providing High-Quality Zinc Coating (Hot Dip).

06 ASTM A325 – High Strength Bolts for Structural Steel.
07 ASTM A500 – Cold formed welded and seamless carbon sheet structural tubing in rounds and shapes.
08 ASTM A992 – Steel for Structural Shapes for use in Building Framing.

1.4 MINIMUM COMPLIANCE STANDARDS

A. The following documents govern the Work, except where more restrictive items are specified:
01 AISC “Code of Standard Practice for Steel Buildings and Bridges”.
02 AWS D1.1-1988 “Structural Welding Code”.
03 Rails must support 200 pound load applied at any point, in any direction in accordance to OSHA.
04 Americans With Disabilities Act (ADA) and Texas Accessibility Standards (TAS).

1.5 DOCUMENT PRECEDENCE

A. Requirements and notations on the Structural Drawings supersede conflicting requirements of this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers for pre-engineered stairs and rails: Shall have a minimum of ten (10) years of experience and employ a Licensed Engineer.

2.2 MATERIALS

A. Steel Shapes, Bars, and Plates: ASTM A36 rolled to the tolerances of ASTM A6.

B. Standard Bolts and Nuts: ASTM A307, Grade A.

C. Anchor Bolts: ASTM A36.

D. Pipe: ASTM A53, standard weight black steel pipe, sizes indicated on the Drawings.

E. Steel Sheet: ASTM A570, commercial quality, hot rolled, U.S. Standard gauges listed are for field fabricated stairs, pre-engineered stairs fabricated from sheet steel of gauge recommended by stair manufacturer.
01 Pan Treads and Risers: minimum 12 gauge.

2.3 STAIR COMPOENENTS

A. Stair Stringers:
01 Provide standard structural C-sections or rectangular tubes as indicated on the Drawings.
02 Stringers shall be continuous within each flight of stairs.
03 Provide closure plates at all exposed open ends of stringers; weld continuous and grind smooth.

B. Stair Tread / Riser Pans:
01 Provide tread / riser stair pans in profiles and shapes as indicated on the Drawings.
02 Stair pans shall be minimum 10 gauge plate steel.
03 Provide perforated riser closures where indicated on the Drawings.

04 Weld stair pans continuous at each stringer; and to interfacing pans where contiguous.
05 Refer to Section 05 50 00 – Metal Fabrications for stair nosings in concrete finished stair treads.

C. Landing Support Columns:
01 Provide minimum 3” pipe columns to support intermediate landings.
02 Support columns shall have minimum 1/2" base and cap plates, fabricated for field bolted connections.

D. Landing and Flight Headers and Framing:
01 Stair headers shall be WF-shape beams or C-Sections as indicated on the Drawings.
02 Landing perimeter framing shall be C-sections or rectangular tubes as indicated on the Drawings.
03 Intermediate supports at stair landings shall be minimum 6” C-Sections spaced at a maximum of 24” O.C.

2.4 SHOP PRIMER SYSTEM

A. Minimum Preparation: Remove loose mill scale, loose rust, and other foreign materials to the standards SSPC.

B. Acceptable Primers: Any primer that meets Federal or SSPC specifications for use over the specified preparation. Three such primers are FS TT-P-86 Type I or II, SSPC-Paint 4-64 T or FS TT-P-664 iron oxide zinc chromate alkyd primer with a thickness of 2.0 mils minimum dry film.

C. Temporary Protection Performance:
01 Length of Protection: Minimum of 6 months exposed at job site.

PART 3 - EXECUTION

3.1 FABRICATION

A. Design and fabricate steel pan stairs and railings to sizes and details indicated on the Drawings.
01 Field verify dimensions prior to fabrication.
02 Construct work true to lines, planes, and design with tight, close fitting joints.

B. Form metal pan treads, risers, and platforms to profiles and depths indicated on Drawings.
01 Nest tread sections into riser sections without exposed connections.
02 Reinforce underside of metal pans with properly sized angle or tee stiffeners spaced to eliminate bouncing and springing action.
03 Provide all necessary supports whether indicated or not.

C. Assemble railings in longest practicable lengths to hold field splices to a minimum. Make changes in direction with closely fitted joints to attain uniform dimensions of members.

D. Provide anchors, bolts, expansion devices, and miscellaneous accessory items necessary for installation.
01 Stair assembly will be designed and fabricated to eliminate exposed fasteners.
02 Where fastenings other than welds must be exposed, countersink and finish flush with exposed surface.
03 All field connections at stair assemblies shall be bolted.

E. After fabrication, paint entire assembly with specified primer.

3.2 INSTALLATION

A. Install pre-engineered stairs per manufacturer's recommendations.

B. Any shimming required to correct elevation shall be added below the first riser. Shimming in excess of one inch will not be acceptable.

C. Coordinate as required for proper installation of associated rail system.

END OF SECTION

SECTION 05 52 13

PIPE AND TUBE RAILING

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide exterior pipe handrail assemblies at ramps, steps and stairs as indicated on the Drawings.
   02 Provide interior pipe handrail assemblies at ramps, steps and stairs as indicated on the Drawings.
   03 Handrail materials – steel, galvanized steel, or stainless steel - shall be indicated on the Drawings for each location.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 05 50 00 – Metal Fabrications
   03 Section 05 51 00 – Metal Stairs
   04 Section 05 52 16 – Decorative Handrail System
   05 Section 05 63 13 – Glass Railing System
   06 Section 09 91 00 – Painting and Re-Painting

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

F. Samples:
01 Provide two (2) samples of each product proposed to be furnished for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 12” but must be large enough to convey attributes of the proposed product.

G. Mock-Up:
01 Provide a mock-up of each handrail system proposed to be furnished.
02 Mock-ups shall be the size necessary to show all components and connections (welded and mechanical) of handrails proposed to be furnished.

1.3 REFERENCES

A. ASTM International:
01 ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
02 ASTM A123 / 123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
03 ASTM A269 – Standard Specification for seamless and welded austenitic stainless steel tubing.
04 ASTM A276 – Standard Specification for stainless and heat resisting bars and shapes.
05 ASTM A312 – Standard Specification for seamless and welded austenitic stainless steel pipe
06 ASTM E894 – Standard Test Methods for anchorage of permanent metal railing systems and rails for buildings.
07 ASTM E935 – Standard Test Methods for performance of permanent metal railing systems and rails for buildings.
08 ASTM E985 – Specifications for permanent metal railing systems and rails for buildings
09 ASTM F3125 – Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 KSI and 150 KSI Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

B. American Welding Society (AWS) – Latest Editions:
01 AWS D1.1 – Structural Welding Code Steel..
02 AWS D1.6 – Structural Welding Code Stainless Steel.
03 AWS B2.1-84 – Welding procedure and performance calculations.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS – GALVANIZED STEEL

A. Interior Pipe:
01 Welded and seamless steel type, ASTM A53, Type S, Schedule 40
02 Finish: plain finish.

B. Exterior Pipe:
01 Welded and seamless steel type, ASTM A53, Type S, Schedule 40

02 Finish: Hot dipped galvanized in accordance with ASTM A123 / A123M.

C. Bolts, Nuts and Washers: High strength steel type, ASTM F3125.

D. Brackets, Flanges and Anchors: Cast or formed metal of the same type of material and finish used for railing.

E. Welding Materials: Applicable AWS D1.1, type required for materials being welded.

F. Finish as indicated on the Drawings.
01 Refer to Section 09 91 00 – Painting and Repainting for painted finishes.

2.2 GENERAL MATERIALS – STAINLESS STEEL

A. Pipe and tubing: ASTM A 269 Type 304 or Type 316.

B. Bar: ASTM A 276 Type 304 or Type 316.

C. Brackets, Flanges and Anchors: Cast or formed metal of the same type of material and finish used for railing.

D. Wire Mesh: Design is based on McNichols Square Stainless Intercrimp Woven Wire Mesh; or equal accepted by the Architect.
01 Mesh Size: Nominal 0.50” x 0.50”
02 Wire Gauge: 16
03 Open Area: 79%

2.3 PIPE RAILING SYSTEM

A. Provide in configurations and profiles as indicated on the Drawings.

B. All handrail systems shall be fabricated and installed in accordance with Texas Accessibility Standards (TAS) and Americans With Disabilities Act (ADA).

C. Posts, Top Rail and Handrails: 1-1/2" diameter

D. Infill Horizontal Diagonal Rails: 1 1/4” diameter

E. Wall Brackets: Design is based on products manufactured by Wagner; or equal as accepted by the Architect
01 Wall Brackets: design is based on Wagner model RB14130 style wall mount handrail bracket in material to match handrail system materials.
02 Pipe Brackets: provide similar style as wall brackets, specifically configured to mount / adapt to mounting on pipe rail.
03 Type: 5/8” diameter bar bend
04 Projection: 3-1/4” from wall to center of handrail
05 Finish: Match handrail system finish

F. Painted Finish at Interior Railings:
01 Shop primed.
02 Refer to Section 09 91 00 – Painting and Repainting for painted finishes.

G. Painted Finish at Exterior Railings:
01 No finish required.

2.4 GENERAL FABRICATION

A. Verify dimensions on site prior to shop fabrication.

B. Fabricate integral railings and component connections capable of resisting a lateral force of 150 lbs. minimum, at any single point, without permanent set or damage.

C. Fit and shop assemble sections in largest practical sizes.

D. Accurately form and fit components and connections.
   01 All steel connections shall be cut to fit and welded continuous
   02 Grind exposed edges and welds smooth and flush.
   03 All connections shall be fitted with flush connectors or welded.

E. Accurately form components required for proper anchorage of stairs, landings and integral railings to each other and to building structure.

F. Thoroughly clean steel surfaces of rust, scale, grease, and foreign matter prior to prime painting. Allow to dry thoroughly before applying priming materials.

G. Shop prime in two coats having a total dry film thickness of 2.0 mils. Do not prime surfaces to be field welded or cast in concrete.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect handrails square, level, plumb and free from distortion or defects detrimental to appearance and performance.

B. Provide necessary anchors, plates, and sleeves as required for connecting handrail to the structure.

C. Ensure alignment with adjacent construction. Coordinate with related work to ensure no interruption in installation.

D. Perform necessary cutting and altering for the installation of work of other sections. Do not perform any other additional cutting without the review of the Architect.

E. Field bolt and weld to match standard of shop bolting and welding.
   01 Conceal bolts and screws whenever possible.
   02 If bolts and screws are not concealed, use flush countersunk fastenings.
   03 Make mechanically fastened joints flush (hairline or better).
   04 Grind welds smooth and flush.

END OF SECTION

SECTION 05 52 16
DECORATIVE RAILING SYSTEM

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide decorative handrail systems at stairs and balcony areas as indicated on the Drawings.
   02 System shall be complete, with all accessories required for a complete installation.

C. Related Work:
   01 Section 05 50 00 – Metal Fabrications
   02 Section 05 51 00 – Metal Stairs
   03 Section 05 52 13 – Pipe and Tube Railings

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Provide 12 inch rail section sample complete with supports/connections and rosette covers to demonstrate stainless steel grade and finish.

G. Mock-up Panel: one section of railing system for verification.
01 Approximate Size: only large enough to show handrail system using all full size components proposed to be furnished.
02 Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
03 Approval of mockups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

H. Structural computations: Provide PE (Professional Engineer) calculations, prepared by a structural engineer licensed in the state of the project, to demonstrate satisfactory structural compliance to applicable building codes.
01 Calculations, when possible, should be based on final fabrication drawings.

1.3 REFERENCES

A. All terms and definitions from the following references for railing related items apply to this section.

B. ASTM International:
01 ASTM A29 – Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
02 ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
03 ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes
04 ASTM A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
05 ASTM A492 – Standard Specification for Stainless Steel Rope Wire
06 ASTM A554 – Standard Specification for Welded Stainless Steel Mechanical Tubing
07 ASTM A580 – Standard Specification for Stainless Steel Wire
08 ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
09 ASTM A743 – Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
10 ASTM E985 – Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

C. ISO – International Organization for Standardization:
01 ISO/TC 59 – Buildings and civil engineering works
a. Reference railing-related items applicable to this section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: The manufacturer of railing system or a qualified installation firm that is approved, authorized, or licensed by railing system manufacturer to install manufacturer's products.

B. Single Source Responsibility: Materials shall be supplied and installed by a single source. Miscellaneous metal fabricators/suppliers are not acceptable.

C. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
01 AWS D1.6/D1.6M – Structural Welding Code – Stainless Steel

D. Execution tolerance plus/minus 5/64”.

E. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.5 PERFORMANCE REQUIREMENTS

A. All railings shall be supplied to conform to applicable sections of the following codes:
   01 International Building Code
   02 ADAAG and Texas Accessibility Standards

B. Railings shall have high strength stainless steel to comply with structural requirements with an appropriate safety margin.

C. Thermal Movements: Provide exterior railings that allow for thermal movements by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

D. Control of Corrosion:
   01 Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   02 All internal members shall be stainless steel, aluminum or nylon to eliminate the possibility of rust.

1.6 WARRANTY

A. Provide manufacturer’s warranty, effective from Substantial Completion of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of decorative handrail systems is based on products manufactured by Viva Railing.

B. The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 VIVA Railing
   02 AGS Stainless

C. Design of decorative handrail systems is based on Viva Railing Circa Railing System
   01 Stainless steel railing system with stainless steel mesh infill panels

2.2 PERFOMANCE REQUIREMENTS

A. General: For engineering decorative metal railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   01 Stainless Steel: 45 percent of minimum yield strength.
   02 Steel: 72 percent of minimum yield strength.

B. Structural Performance: Decorative metal railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   01 Handrails and Top Rails of Guards:
      a. Uniform load of 50 LB FT per FT applied in any direction.

b. Concentrated load of 200 LB FT applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

02 Infill of Guards:
a. Concentrated load of 50 LB FT applied horizontally on an area of 1 SF.
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

2.3 MATERIALS – GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
01 Provide stainless steel wall brackets with flange tapped for concealed anchorage with vertical and horizontal adjustment capability.

C. Stainless Steel Tubing: ASTM A554, Grade MT 304.

D. Stainless Steel Pipe: ASTM A312/A312M, Grade TP 304.

E. Stainless Steel Castings: ASTM A743/A743M, Grade CF 8 or CF 20.

F. Stainless Steel Sheet, Strip, Plate, and Flat Bar: ASTM A666, Type 304.

G. Stainless Steel Bars and Shapes: ASTM A276, Type 304.

H. Steel Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

I. Posts: Tube, made from stainless steel.
01 Post top caps to be fully-welded to posts and ground smooth, leaving no seam marks.

J. Top Rail / Hand Rail: Tubular stainless steel pipe

K. Woven-Wire Mesh Infill: Intermediate-crimp, woven-wire or woven-strap mesh, made from wire complying with ASTM A580/A580M, Type 304, in a 0.98-inch wide by 0.59-inch deep fully-welded stainless steel "C" frame, ground smooth without visible seams.

2.4 FASTENERS

A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

B. Anchors shall be fabricated from stainless steel or other materials as determined by engineering requirements with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other wherever possible.
01 Provide hex, hex socket, or hex-button head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

2.4 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Stainless steel with center of handrail 2-1/2 inches from face of railing system or wall per Texas Accessibility Standards.

B. Provide brackets with flange tapped for concealed anchorage to threaded hanger bolt.

2.7 FABRICATION

A. General: Fabricate decorative metal railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage[, but not less than that required to support structural loads.

B. Shop assemble railings and guards to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
   01 Clearly mark units for reassembly and coordinated installation.
   02 Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.
   01 Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
   02 Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

F. Connections: Fabricate railings with welded or mechanical with concealed fasteners connections unless otherwise indicated.

G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   01 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   02 Obtain fusion without undercut or overlap.
   03 Remove flux immediately.
   04 At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

H. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
   01 Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   02 Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

I. Fabricate railing system for compliance with structural requirements of applicable code(s).

J. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1” x 1/2" x 1/8” metal channel frames.
   01 Fabricate woven-wire mesh and frames from stainless steel.
   02 Orient woven-wire mesh with wires perpendicular and parallel to top rail.

K. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.

L. Stainless steel tubing cut shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.

M. Cut, drill, and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.

N. Form work true to line and level with accurate angles and surfaces.

O. Fabricate connections that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

P. Close exposed ends of railing members with prefabricated end fittings.

Q. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for installer. Locate reinforcements and mark locations if not already done.

B. Do not begin installation until substrates have been properly prepared.

C. Verify that reinforcement and anchoring devices are the correct type, have been located correctly, and have been installed properly.

D. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.

3.2 PROJECT CONDITIONS

A. All measurements for handrails and railings should be taken from construction site elements to which railings are to fasten. This information to be recorded on final shop drawings.

B. Coordinate fabrication schedule with construction progress to avoid delay of work.

3.3 PREPARATION

A. Provide information on fastening point locations for posts where necessary to relevant parties.

3.4 INSTALLATION

A. Installation shall be by HDI Railing Systems or a qualified, authorized representative of the manufacturer.

B. Installation must be in accordance with standard or non-standard, yet applicable details (instructions) included on installation/shop drawings provided by HDI Railing System.

C. Install components plumb and in-line, accurately fitted, free from distortion or defects and securely anchored to structure.

D. Provide anchors, plates, angles, etc. necessary for connecting railings to structure.

E. Any and all field welding shall be by a certified welder.

F. Access for anchors that require through bolting either vertically or horizontally to be made available through General Contractor.

G. Expansion Joints: Install expansion joints where needed to accommodate thermal movement.

3.5 ERECTION TOLERANCES

A. Maximum variation from plumb shall be 1/4".

B. Maximum offset from true alignment for every 50-foot of railing shall be 1/4”, non-accumulative.

3.6 PROTECTION

A. General Contractor to provide protective covering on handrails and guardrails if construction is not yet finished in the area where the railings are installed.

3.7 MAINTENANCE AND CLEANING

A. Railing shall be cleaned, including filler panels, by Contractor to the satisfaction of the Owner.

B. Wipe with moistened cloth only. Do not use cleaning agents with abrasive or acid/alkaline content.

3.8 CORRECTION OF DEFICIENCIES

A. All deficiencies in work and/or items not meeting specified requirements shall be corrected in order to meet specification requirements at no additional cost to Owner.

END OF SECTION

SECTION 05 73 13

GLASS RAILING SYSTEM

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Furnish and install all glass railings and handrail systems as indicated.
   02 The system shall be complete with all components and hardware required for a complete installation.

C. Related Work:
   01 Section 03 30 00 – Cast-in-Place Concrete
   02 Section 05 12 00 – Structural Steel Framing
   03 Section 05 52 13 – Pipe and Tube Railing
   04 Section 05 52 16 – Decorative Railing System
   05 Section 05 12 50 – Architecturally Exposed Structural Steel

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Samples:
   01 Submit two (2) samples of railing components showing style and finish. Samples shall be of sufficient size to show all attributes of each component.

02 Submit two sample(s) of a full-size mock-up of a panel consisting of (1) post / escutcheon and a foot of glass panel and clips and top rail for evaluation of surface preparation techniques, finish and application workmanship.
03 Provide a typical partial handrail with bracket.

G. Certificates:
01 Furnish manufacturer's certification that materials meet specification requirements.
02 Furnish certification and calculations by an engineer registered in the state where the project is located showing that safety requirements are met.

1.3 REFERENCES

A. American Institute of Steel Construction (AISC):
01 Manual of Steel Construction.

B. American Iron and Steel Institute (AISI):
01 Steel Products Manual; Stainless and Heat Resisting Steel.
02 Code of Standard Practice.

C. American National Standards Institute (ANSI):
01 ANSI A21.1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.
02 ANSI A58.1 Minimum Design Loads in Buildings and Other Structures.
03 ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities.
04 ANSI A97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Material used in Buildings.
05 ANSI/NAAMM MBG 531 Metal Bar Grating Manual.

D. ASTM International (ASTM):
01 ASTM A167 Specification for Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
02 ASTM A269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
03 ASTM A276 Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
04 ASTM A312 Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
05 ASTM A554 Welded Stainless Steel Mechanical Tubing
06 ASTM A570 Specification for Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality.
07 ASTM A575 Specification for Steel Bars, Carbon, Merchant Quality, M Grades.
08 ASTM A582 Free Machining Stainless and Heat Resisting Steel Bars.
09 ASTM A743 Specification for Corrosion-Resistant Iron Chromium, Iron Chromium-Nickel, and Nickel Base Alloy Castings for General Application.
10 ASTM A1264-1 Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
11 ASTM C1036 Standard Specification for Flat Glass.
12 ASTM C1048 Standard Specification for Heat Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
13 ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
14 ASTM E84 Test Method for Surface Burning Characteristics of Building Materials.
15 ASTM E894 Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
16 ASTM E935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

17 ASTM E985 Specification for Permanent Metal Railing Systems and Rails for Buildings.
18 ASTM E1300 Standard Practice for Determining Load Resistance of Glass in Buildings.
19 ASTM E1481 Terminology of Railing Systems in Rails for Buildings.
20 ASTM E2353 Standard Test Methods for Performance of Glass in Permanent Glass Railing Systems, Guards & Balustrades.
21 ASTM E2358 Standard Specification for Performance of Glass in Permanent Glass Railing Systems, Guards & Balustrades.

E. American Welding Society (AWS):
01 AWS Specifications for Welding Rods and Bare Electrodes.

F. Americans with Disabilities Act Standards for Accessible Design (ADASAD).

G. International Code Council (ICC):
01 International Building Code (IBC).

H. Iron and Steel Society (ISS):
01 Steel Products Manual
02 Sheet Steel.
03 Stainless and Heat Resisting Steels.

I. National Association of Architectural Metal Manufacturers (NAAMM):
01 NAAMM/NOMMA Metal Finishes Manual.
02 Pipe Railing Manual.
03 Metal Stair Manual.

J. National Fire Protection Association (NFPA):
01 NFPA 101 Life Safety Code.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2-year experience installing similar products.

C. Regulatory Requirements:
01 Components and installation shall be in accordance with state and local code authorities.
02 Components and installation shall comply with current ADASAD or ICC/ANSI A117.1 guidelines.

D. Certifications:
01 Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
02 Furnish certification that components were installed in accordance to the manufacturer's engineering data to meet the specified design loads.

E. Mock-Up:
01 Provide a full size mock-up of one panel consisting of (2) posts and a glass panel and clips for evaluation of surface preparation techniques and application workmanship.
02 Provide a typical partial handrail with bracket.
03 Do not proceed with remaining work until workmanship is approved by Architect.

04 Refinish mock-up area as required to produce acceptable work.

1.5 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

B. Pre-Installation Meeting:
   01 Prior to the beginning of work, conduct a pre-job conference at the job site.
   02 Provide seven calendar days' advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owner's representative, architect and subcontractors whose work interfaces with the Work of this section.
   03 Review the specifications to determine any potential problems, changes, scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.
   04 Record the results of the conference and furnish copies to all participants.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

B. Storage On Site:
   01 Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.
   02 Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
   03 Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

1.7 PROJECT CONDITION

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.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

B. Ensure that field preparation of Work of this section is completed in time to prevent interruption of construction progress.
   01 Field measuring for weld plates, sleeves and insert locations.
   02 Field measuring.
   03 Anchors or inserts for terrazzo or precast concrete.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Design of Glass Railing System is based on products by: R & B Wagner.

B. Alternate Manufacturers will be considered provided their railing systems meet or exceed the specified system in all facets. The following manufacturers are approved to submit their system for the Architects review.
   01 HDI Railing Systems
   02 Livers Bronze
   03 Hoffa, Inc.
   04 Gulf Coast Railings
   05 Architectural Metal Crafts, Inc.
   06 Berger Iron Works
   07 Houston Stair Company
   08 Morse Industries
   09 Visa Railings, LLC., “Circa Glass Railing System”

2.2 MATERIALS

A. Design of glass railing system is based on R & B Wagner Legato Railing System

B. Railing System components
   01 Posts: Schedule 40, .145” wall thickness, 1.9 O.D., grade 316 satin stainless steel ‘Legato” post kits with mechanical fittings and attachment for field installation.
      a. Infill: ½ inch thick tempered laminated safety glass panels
      b. Color: Clear
      c. Exposed glass edges ground and polished smooth
      d. Clamps: Round
   02 Top Railing: 2.5” O.D., grade 304 satin stainless steel, .062” minimum wall thickness.
   03 Shop fabricate such that no jobsite welding, grinding or cutting is required.
   04 Finish: Brushed satin stainless steel #4 finish.
   05 Post height: 42 inch
   06 Post Configurations:
      a. End Post Surface Mount
      b. Mid Post Surface Mount

C. Heavy duty stainless steel bottom flange with snap on stainless steel decorative flange cover.

D. Provide 1.5” O.D. stainless steel handrails at all stairs in addition to the Railing System. Handrails can be mounted to the railing system posts with stainless steel brackets fabricated for this purpose.
   01 Handrails shall conform to ADA and TDLR requirements.

2.3 STRUCTURAL REQUIREMENTS

A. Delete if not required. Railing assembly shall withstand a minimum concentrated load of 200 pounds applied vertically downward or horizontally in any direction, but not simultaneously, at any point at the top of the guard or handrail.

B. Railing assembly shall withstand a minimum uniform load of 50 pounds per foot applied horizontally or vertically downward, but not simultaneously, on the guard or handrail.

C. Guard intermediate rails, balusters, panel fillers, cable infill, or posts shall be designed for a uniform load of not less than 50 pounds per square foot applied horizontally over the gross area of the guard of which they are part. Reactions due to this loading need not be added to the loading specified for the main supporting members of the guard.

2.4 MATERIALS AND FINISHES

A. Stainless Steel:
   01 Type 316
   02 Bar: ASTM A 167
   03 Pipe and Tubing: ASTM A 269 top rail
   04 Pipe and Tubing: ASTM A 312 posts
   05 Finish: Ornamental Grade, AISI No. 4

B. Glass:
   01 Laminated, fully tempered, ASTM C 1172, with PVB interlayer.
   02 Glass thickness shall be as specified by the manufacturer based on panel sizes; and shall meet or exceed all code requirements and loading limits.
   03 Tint: clear

2.5 FASTENERS

A. Mechanical fasteners used in the assembly of stainless steel or aluminum railings shall be manufactured from stainless steel.

2.6 FABRICATI0N

A. Form rail-to-end post connections and all changes in rail direction by radius elbows.

B. Cut material square and remove burrs from all exposed edges, with no chamfer.

C. Make exposed joints butt tight and flush.

D. Close exposed ends by use of appropriate end cap.

E. For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.

F. Verify dimensions on site prior to shop fabrication.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Supply items to be cast in concrete, embedded in masonry and placed in partitions.

3.3 INSTALLATION

A. Install in accordance with shop drawings and manufacturer's instructions at locations indicated on the drawings.

B. Erect work square and level, horizontal or parallel to rake of steps or ramp, rigid, and free from distortion or defects detrimental to appearance or performance.

C. Expansion joints shall be provided as needed to allow for thermal expansion or contraction.

3.4 CLEANING

A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish and restore in accordance with NAAMM/NOMMA Metal Finishes Manual.

D. Finish shall not be removed from anodized aluminum.

3.5 REPAIR OF DEFECTIVE WORK

A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

B. Repair damaged finish as directed by Architect.

C. Replace defective or damaged components as directed by Architect.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 05 76 00

INTERIOR DECORATIVE METAL PANELS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 SUMMARY

A. Refer to Section AB – Instructions to Proposers.

B. This Section includes Interior Decorative Metal Panels as shown on Drawings or scheduled.

C. Related Work:
01 Section 04 20 00 – Unit Masonry
02 Section 09 21 13 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
01 Include recommended cleaning products and instructions for use. Provide recommended cleaning methods, stain removal methods, polishes and waxes.
02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
03 Provide two (2) samples of each finish for selection by the Architect.
04 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
05 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 5 years' experience in manufacturing decorative metals for commercial use.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in manufacturer's original packaging, properly labeled for identification and installation purposes.

B. Store in location to avoid damage from job-site traffic, direct sunlight, moisture, stacking or other job-site contaminates. Store in a completely supported flat position. Edge storage is not recommended.

C. Handle components to avoid denting or scratching of finished surfaces.

D. DO NOT use markers on protective PVC film. Some types of ink will permeate the film and mark the material surface.

1.5 PROJECT CONDITIONS

A. Maintain a constant temperature range of 65°F to 85°F (18°C to 24°C), with stable relative humidity, for at least 48 hours prior to, throughout the installation period and maintained consistently thereafter.

B. Installation locations must be enclosed, weatherproofed and climate controlled prior to commencing installation.

C. Do not install if relative humidity is greater than 80%.

1.6 WARRANTY

A. Provide manufacturer's warranty against defects in material and workmanship. Minimum one (1) year from Substantial Completion Date.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Design of interior decorative metal wall panels is based on products manufactured by Móz Designs, Inc.
   01 Interior decorative metal wall panels are based on specific products, finishes and colors as identified on the Drawings.
   02 Substitutions will be considered only if the proposed substitution is a match to the specified product(s) identified on the Drawings. Refer to section 01 25 00.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this section, provide all proposed products meet or exceed the specified requirements. Additionally, the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules. Submit proposed product for review and acceptance by Architect during bidding / proposal phase.
   01 Chemmetal

2.2 MATERIALS

A. Aluminum 'Moz Metals'
   01 .063" Aluminum: Type 5052 alloy complying with ASTM B209
   02 Sizes: as shown on Drawings.
   03 Color & Pattern: as indicated on finish legend
   04 Finish: Polycoat Gloss (GL)

B. Standoff Sign Mounting Hardware
   01 Provide 1" projection aluminum standoff hardware by G+E Grand + Benedicts or approval equal.
   02 Model: 289-STANDOFF-1
   03 Color: Aluminum
   04 Size: 1" Diameter x 3/8" tall cap.
   05 Finish: Satin Anodized
   06 Provide 6 attachments minimum for .063" thick panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine product, substrates and installation conditions.

B. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.

C. Do not proceed with work until conditions have been corrected.

3.2 SURFACE PREPARATION

A. Prior to installation, clean surface to remove dirt, debris and loose particles. Perform additional preparation procedures as required per the manufacturer's instructions.

B. Protection: Take all necessary precautions to prevent damage to materials during installation.

3.3 INSTALLATION

A. Install the work of this section in strict accordance with manufactures written Technical Information and workability guidelines. Install metal panels in configurations as shown on drawings with stand-offs for a complete and finished installation.

3.4 CLEANING

A. Remove protective coverings and clean decorative metal to remove adhesives and tape residue. Test all solvents on non-exposed surfaces prior to use.
   01 For painted surfaces, use a mild detergent solution on a soft cloth.
   02 For stainless steel, use a glass cleaner and a soft cloth.
   03 For other surfaces, contact manufacturer for proper cleaning procedures.
   04 For HEAVY CLEANING and removal of grease, use oil based mineral spirits or naphtha. Low concentration ammonia-based cleaning agents such as glass cleaners may also be used.
   05 Minor scuffs can be polished out by hand with a #6 to #9 type finishing polish or wax.

06 DO NOT treat with rubbing compounds or lacquer thinner as this may dissolve or etch the coating.

B. Visually inspect all exposed surfaces for scratches or blemishes.

C. Protect Decorative Metal from damage during remainder of construction period.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide blocking in metal framed drywall partitions and other assemblies as required for the secure attachment of built-in assemblies / products and assemblies / products that anchor to drywall partitions.
   02 Provide treated blocking at all door and window openings in exterior walls as indicated on the Drawings.
   03 Provide treated wood blocking at roofing system as indicated on the Drawings and / or as required to comply with requirements of roofing manufacturer.
   04 Provide plywood backup behind gypsum board at electrical and technology rooms as required for installation of wall mounted equipment.
   05 Coordinate with all trades and material suppliers to ascertain blocking requirements.

C. Related Work:
   01 Section 06 20 00 – Finish Carpentry
   02 Division 7 – Roofing and Roof Accessories
   03 Division 8 – Doors, Windows and Glazing
   04 Division 10 – Specialties
   05 Division 11 - Equipment

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Test Reports: Certified test reports showing compliance with the specified performance characteristics and properties.

D. Certificates: Certification from the treatment plant certifying wood treatment applied complies with the criteria and physical requirements for ACQ preservative-treated wood products as specified herein.

E. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of field fabrications, connections and details.
   03 Show connection details to specific, relative interfacing materials and assemblies.

1.3 STANDARDS AND GRADING

A. All lumber used structurally shall be graded and marked with grade and trademark of a lumber grading organization approved by the Architect, except that a certification of grade from such a grading organization may be accepted in lieu of grade and trademarks when approved by the Architect. Trademark of manufacturer shall also appear on each piece.

B. Each piece of plywood used structurally shall carry the American Plywood Association trademark.

C. Grading Rules: Conform with all applicable requirements of American Lumber Standards "Simplified Practice Recommendations R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.

D. Reference Standards: (Conform with all requirements)
   01 U.S. Dept. of Commerce Product Standards.
   02 American Wood Preservers Assoc. Standards (as they apply).
   03 Architectural Woodwork Institute "Quality Standards".
   04 Western Wood Products Association Manual.

E. ASTM International
   01 ASTM F2329 – Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

F. National Fire Protection Association:
   01 NFPA 285 – Standard Fire Test Methods for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Materials

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:
   01 Treated No. 2, S4S Southern Yellow Pine:
      a. Comply with NWMA Standards.
      b. Use for blocking, stripping, grounds, cants and miscellaneous wood items.
   02 No. 2, S4S Southern Yellow Pine: Use for framing, blocking, stripping and miscellaneous concealed interior lumber not exposed to concrete, roofing weather or moisture, when FRS lumber is not required by building code.
   03 Fire Retardant No, 2, S4S Southern Pine: Lumber shall be pressure-impregnated with non-combustible fire retardant chemicals in accordance with U.L. FRS Fire Hazard Classification. All lumber must be dried following treatment in accordance with AWPA Standard C-20. Use for all blocking in partitions; and other locations where required by building code or indicated on the Drawings.

B. Preservative Wood Treatment:
   01 Wood products shall be treated with waterborne, alkali-based wood preservatives listed in Section 4 of AWPA Standards U1, excluding those which contain arsenic and / or chromium.
   02 All treated wood products not in direct contact with the ground / earth shall meet requirements standards of the American Wood Preservers Association (AWPA) Standard U1 for Use Category 4A.
   03 Copper Azole Type-C (CA-C) with minimum treatment rate of 0.15 PCF.
   04 Micronized Copper Azole (MCA) with minimum treatment rate of 0.15 PCF.

05 Use galvanized fasteners where not exposed to direct moisture. Use stainless steel fasteners where exposed to direct moisture.
06 Provide Isolation material between wood and adjacent metal surfaces.

C. Fire Retardant Pressure Treatment of Lumber and Plywood:
01 Lumber: Comply with AWPA U1 UCFA, Type A or ICC-ES ESR 2645.
02 Plywood: Comply with AWPA U1, UCFA, Type A or ICC-ES ESR 2645.
03 Surface Burning Characteristics: UL FR-S rating; or flame spread and smoke developed ratings of 25 or less in a test of 30 minutes' duration in accordance with IBC section 2303.2.
04 Kiln dry after treatment to 19 percent maximum moisture content for lumber and 15 percent for plywood.
05 Treatment: Viance “D-Blaze FRT”; Dricon “Dricon FRT”; or approved equal.
06 Provide fire retardant wood where ever part of a fire rated assembly; where required by code; and where required by local jurisdiction.
07 Provide fire retardant wood in exterior wall assemblies as required to meet NFPA 285 requirements.

D. Plywood:
01 General: Comply with APA Standards.
02 APA A-D, Group 1 Interior used where appearance of only one side is exposed to view for interior locations.
03 Exterior plywood, Group 1, APA rated sheathing. Use where miscellaneous plywood is exposed to concrete or weather.
04 Fire Retardant Treated Plywood - Identical to "C.03" with pressure-impregnated non-combustible fire-retardant chemicals in accordance with U.S. FRS Fire Hazard Classification, AWPA Standards C-27. Use when required by building code or noted on Drawings.
05 Flooring Underlayment: APA rated Sturdi-floor, exterior grade, tongue and groove edges.

E. Sheetmetal Blocking:
01 Sheetmetal blocking may be an acceptable alternative to wood blocking for wall attached equipment and assemblies.
02 Minimum Size: 16 gauge x 6” height sheetmetal.
03 Pre-galvanized or hot-dipped galvanized material.
04 Sheetmetal blocking shall be continuous and extend to the next stud beyond the equipment or assembly.

F. Rough Hardware:
01 Nails, Spikes, and Staples:
a. Galvanized rough hardware shall conform to ASTM F2329.
b. Provide galvanized hardware for exterior locations and high humidity locations; excluding treated wood conditions.
c. Provide Type 304 or 316 stainless steel hardware for all fastening to treated wood.
d. Use largest size and type to suit application.
02 Bolts, Nuts, Washers, Lags, and Screws:
a. Medium carbon steel, A-307 or A-325; size and type to suit application if not noted on the Drawings.
b. Galvanize for exterior locations, high humidity locations, treated wood not directly exposed to moisture, and fire-retardant treated wood.
c. Type 304 or 316 stainless steel for all fastening to treated wood.
d. Plain finish for other interior locations.
e. Carriage bolts shall be used to connect roof edge wood blocking to the steel perimeter angle.

03 Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry and concrete. Bolts or power activated type for anchorage to steel.

G. Treated Wood Isolation: All treated material shall be installed with an isolation sheet between the wood and adjacent metal surface.
01 Provide 15 lb. asphalt impregnated building felt or other isolation material as recommended by the treatment manufacturer.

H. Electrical Room / Technology Room / Punch-Down Boards:
01 Use grade stamped DFPA, grade A/D.
02 Provide 4' x 8' sheets of 3/4 inch plywood for telephone boards in mechanical rooms; telephone rooms and other areas where needed for attachment of equipment of other trades.
03 Provide 3/4 inch plywood up to 8'-0" above finish floor and in front of finished gyp board at all walls of the technology Head End Room (alternate names include M.D.F. Room, Building Demarcation Room).
04 Provide 3/4 inch plywood up to 8'-0" above finish floor behind finished gyp board at all wall(s) in IDF Rooms where wall mounted equipment is indicated.
05 Where exposed, paint as scheduled in Section 09 9100 – Painting and Re-Painting. **Do not conceal or cover the rating stamps/labels with paint.**

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Blocking in metal framed drywall partitions shall be required at, but not limited to the following locations:
01 All recessed or semi-recessed equipment and assemblies.
02 All wall hung surface equipment and assemblies.
03 All wall attached equipment and assemblies.
04 Other equipment or assemblies as recommended by the manufacturer for proper installation.

B. Wood Blocking:
01 Use standard 2x lumber materials for blocking, nailers and other similar applications. Provide 1x materials where indicated or necessary to achieve the required thickness.
02 Rip, chamfer and / or cut material as required fit the application / assembly.
03 Non-continuous blocking supporting continuous 2x blocking or nailers shall be a minimum of 16" long and installed so the maximum gap is 24".
04 Blocking at all recessed equipment and fixtures shall be continuous all sides.
05 Bolt nailers and blocking to steel, masonry or concrete members with bolts or proportionate strength of members attached from each end, except as otherwise noted on plans.
06 Blocking Locations: Provide wood blocking at all built-in work, in walls for anchoring cabinets, and other locations as indicated on the Drawings.
07 Provide blocking, bucks and framing as necessary and for other trades as required.
08 Wood blocking within a wall shall be installed stud-to-stud. Blocking attached to a single stud shall not be acceptable.

C. Roof Edge Wood Blocking:
01 Provide continuous wood blocking at roof perimeter as indicated on the Drawings.
02 Anchor to steel perimeter angle / framing at 24" O.C. maximum using a 3/8" minimum carriage bolt, inserted from the underside of the perimeter angle.

03 Counter-sink wood blocking 3/4" maximum depth to accommodate the bolt washer, nut and any protruding thread.
04 Size length of bolt to not protrude above the top surface of the wood blocking.

D. Plywood:
01 Install plywood over framing in accordance with instruction of American Plywood Association Construction Guide Form No. E30C.
02 Install underlayment plywood in accordance with instructions of American Plywood Association.
03 Space panel joints and edges 1/32 inch.
04 Fill and sand panel edge joints, surface roughness, and damaged or open areas.
05 Fasten with screws spaced at 6 inches at edges and 8 inches in field each way.

E. Sheetmetal Blocking:
01 Contractor shall submit requested locations or conditions proposed to use sheetmetal blocking to the Architect for review and acceptance.
02 Where accepted, sheetmetal blocking shall be fastened / screwed to each metal stud in a minimum of two (2) locations per stud. Use standard drywall screws for fasteners.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1- GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Finish Carpentry
   02 Millwork
   03 Plastic Laminate
   04 Installation of finish hardware and plastic laminate doors.

C. Related Work:
   01 Section 06 10 00 – Rough Carpentry
   02 Section 08 14 23.16 – Plastic Laminate Faced Wood Doors
   03 Section 08 71 00 – Door Hardware
   04 Section 12 32 16 – Manufactured Plastic-Laminate-Clad Casework

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.
   04 Submit full range of colors, patterns, and textures for plastic laminate for Architect's selection.
   05 Submit representative, minimum 18" samples of all hardwood proposed to be furnished.
   06 Submit samples of range of stains on actual hardwood samples.
   07 Submit samples of each type of cabinet hardware proposed to be furnished.

1.3 MINIMUM COMPLIANCE STANDARDS

A. The “Quality Standards of the Architectural Woodwork Industry” governs the work, except where more restrictive items are specified.

PART 2 - PRODUCTS

2.1 PLASTIC LAMINATE

A. Thickness: Horizontal grade for all finished / exposed surfaces. Vertical grade may be used for cabinet interiors only. Use .020 balance sheet.

B. Pattern Finish Selection: As selected by Architect.

C. Pattern Range: Include all standard colors.

D. Acceptable Manufacturer:
   01 Wilsonart – Ralph Wilson Plastic Co.
   02 Formica – The Formica Corporation.

2.2 SOLID STOCK

A. Moisture Content: Percent of moisture in relation to over-dry weight shall be between 8% and 13% at time of installation.

B. Natural Finish Hardwood: Red Oak. Comply with AWI "Premium" Grade.

C. Paint Grade Hardwood: Any species, including Parana Pine. Do not use Oak, Elm or similar species which have coarse grain.

D. Blocking / Hangers: refer to Section 06 10 00 – Rough Carpentry

2.3 HIGH PERFORMANCE CORE MATERIAL

A. All core materials shall be an Industrial Grade particle board which shall meet or exceed performance requirements for ANSI A208.1-1999 M2 Standards.

B. All core materials shall be 3/4" material; minimum 45 lb. density.

C. All core materials shall have a minimum 250 lb. screw holding capacity on the face plane and minimum 225 lb. screw holding capacity on the edge plane.

D. Edging types. 3 mm thick PVC. Solid, high-impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.

2.4 MISCELLANEOUS

A. Utility shelving: AWI "Economy" grade.

B. Natural Finished Millwork: AWI "Premium" Grade:
   01 Wood Type: White Oak.
   02 Grain Pattern: Rift-cut.

C. Clear Acrylic/Plexiglas: 1/4 inch thick panels fastened to walls where indicated on Drawings.

2.5 MILLWORK CABINET HARDWARE

A. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Engineered Products Company (EPCO)
   02 Julius Blum
   03 Knape & Vogt
   04 National
   05 Rockford Process Control (RPC)
   06 Stanley

B. Hinges: Heavy duty, five knuckle 2 3/4 inch institutional type hinge shall meet ANSI/BHMA A156.9 Grade 1 requirements. Mill ground, hospital tip. Hinge shall be full wrap around type of tempered steel .095 inch thick. Each hinge shall be adjustable in both vertical and lateral directions to assure positive door attachment and alignment.
   01 One pair per door up to 48-inch height. One and one-half pair over 48 inches in height. Hinge shall accommodate 13/16 thick laminated door and allow 270 degree swing.
   02 Finish shall be 26D satin chromium plated finish. Stanley # 351490, class 1592 Interleaf Casework Hinge, or equal.

C. Pulls: Wire design, solid brass, 4 inches x 1-5/16 inch projection, in 26D satin chromium plated finish. Stanley # 348315-4” or equal.

D. Locks:
   01 Pin tumbler, cam type locksets, allowing removal of key when lock is in unlocked position. Locks shall be CompX National M2-0219 series; or approved equal.
   02 Locks keyed alike and master keyed as directed by the Architect / Owner.
   03 Dull chrome finish.
   04 Provide catches on non-active leafs on door pairs.
   05 Provide cabinet locks on units as indicated on the drawings. If not indicated on the drawings, provide locks for 50% of the doors and drawers. Coordinate locations with Architect.

E. Drawer Slides:
   01 Standard Drawers: Full extension, telescopic, self-closing design, steel ball bearing operation with positive in-stop, out-stop. Minimum 100 lb. dynamic load rating. Electro-zinc plated with lacquer top coat. Knape & Vogt # 8417 or equal.

02 File Drawers: Full extension, 3-part progressive opening slide on precision steel ball bearings; minimum 100 lb. dynamic load rating; hold-in feature to prevent bounce-back; positive in / out stops, Electro-zinc plated with lacquer top coat. Knape & Vogt # 8500 or equal.

03 File Drawers: Provide integral, body mounted molded rails for hanging file system for legal and letter file drawers. Cutting or machining of drawer body / face is not allowed.

F. Catches: Catch shall provide opening resistance in compliance with the Americans with Disabilities Act.

01 Non-Locking Doors: Provide top-mounted magnetic catch for base and wall cabinet doors. Provide two at each tall cabinet door. EPCO no. 592, or equal.

02 Pair of Doors: Furnish a catch equal to EPCO no. 1018, or equal, on the door not receiving a lock. One required on doors up to 48 inches tall and two required (top and bottom) on doors over 48 inches tall.

G. Adjustable Shelf Supports: Twin pin design with anti-tip-up shelf restraints for both 3/4 inch and 1-inch shelves.

01 Design shall include keel to retard shelf slide-off, and slot for ability to mechanically attach shelf to clip.

02 Load rating shall be minimum 300 lbs. each support without failure.

03 Cabinet interior sides shall be flush, without shelf system permanent projection.

H. Sliding Glass Door Hardware:

01 Framed Assembly Sliding Doors: Design based on EPCO Assembly 16 (modified to #730 head / jamb track), complete for the intended installation; or accepted equal.

02 Continuous top and jamb tracks, continuous glazing shoes, track base with double track, and rollers.

03 Sliding Glass Door Lock: Ratchet type lock. Design based on EPCO G05 series locks; or equal.

I. Wardrobe Rod: Shall be 1 1/16 inch rod, supported by flanges both sides, chrome finish or equal.

J. Coat Hooks:

01 Single prong coat hooks, ceiling mount. Satin finish.

02 Double prong coat hooks, ceiling mount. Satin finish.

K. Grommet:

01 Design is based Doug Mockett & Co. Model “XG”, 3” diameter, round grommet with flip top series; or approved equal.

02 Provide one (1) grommet at each non-plumbing knee space with power below countertop.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Positioning: Place approximately level, plumb and at right angles to adjacent work. Maintain consistent spacing between elements where indicated on the Drawings.

B. Fitting: Where field cutting or trimming is necessary, perform in a neat, accurate, professional manner without damaging the products and adjacent work.

C. Anchorage: Attach securely so the products will perform to their maximum ability without damage from inadequate fastenings.

D. Fasten tops to frames with concealed clips, screws and glue.

3.2 PLASTIC LAMINATE DOOR INSTALLATION

A. Carefully verify that doors are properly installed at intended door location and that door prep for finish hardware is accurate and complete.

B. Install all doors plumb and square to frame with +/- 1/8” clearance between door and frame.

C. Install finish hardware in accordance with approved templates.

D. Verify that top and bottom rails are sealed prior to door installation.

E. Take all necessary precautions to protect door finishes before, during and after installation. In the event of damage to the plastic laminate surfacing, replace door.

F. Upon completion of door installation, cycle door several times to confirm that door, frame and hardware are all installed and functioning correctly.

3.3 FINISH HARDWARE INSTALLATION

A. The supplier will mark each item hardware for location. Protect the markings until each item is installed. If any item is delivered to the job not properly marked, return it to the supplier for marking before attempting to install it.

B. Check markings on hardware for proper location. Install and make necessary adjustments for proper working order. Any hardware damaged by improper adjustment or careless abuse will be replaced by the Contractor at his expense.

C. Provide clean, properly sized and accurately placed mortises and drilled holes for all mortise hardware such as locksets and for cylindrical locks where specified only.

D. Accurately fit all surface-applied hardware.

E. After hardware is installed, protect exposed surfaces by use of heavy paper and masking tape and maintain until job completion.

F. Remove all finish hardware except that which is primed for painting before painter's finish is applied. Permanently replace and re-adjust for proper function after painter's finish has dried hard.

G. Do not strip heads of Phillips head screws. Remove and replace all stripped or damaged screws.

H. Refer to Section 08 71 00 – Door Hardware for hardware requirements.

END OF SECTION

SECTION 07 13 63

SHOWER STALL WATERPROOFING

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide liquid membrane waterproofing at all job-built (non-prefabricated) shower stalls.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 09 21 16 – Gypsum Board Assemblies
   03 Section 09 30 13 – Ceramic Tiling

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

D. Manufacturer's sample warranty.

1.3 REFERENCES

A. ANSI A118.10 – Standard Specifications for Load Bearing, Bonded, Waterproof Membrane for This-Set Ceramic Tile and Dimension Stone Installation.

B. ANSI A118.12 – Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.

C. IAPMO – International Association of Plumbers and Mechanical Officers standards and recommendations.

1.4 WARRANTY

A. Warrant the work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials or workmanship.

B. Defects shall include, but not be limited to the following:
   01 Leaking.
   02 Releasing from substrate.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on Laticrete Hydro Barrier Membrane Waterproofing System.

B. Acceptable Manufacturers: The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Mapei International
   02 NAC Products
   03 Noble Company

2.2 MATERIALS

A. Material shall be a load bearing, self-curing, liquid applied rubber polymer suitable for use at exterior and interior locations.

B. System shall be comprised of liquid applied rubber polymer used in conjunction with reinforcing fabric applied at all cracks, floor / wall transitions, wall substrate joints and other vertical transitions.

C. Physical Properties: product shall meet or exceed the following:

01	7-Day Hydrostatic Test	ANSI A118.10	Pass
02	7-Day Tensile Strength	ANSI A118.10	265 – 300 PSI
03	7-Day Water Emersion	ANSI A118.10	95 – 120 PSI
04	7-Day Shear Bond	ANSI A118.10	200 – 275 PSI
05	System Crack Resistance Test	ANSI A118.10	Pass
06	Water Vapor Transmission	ASTM E96	0.515 Grs./Hr./SF
07	Water Vapor Performance	ASTM E96	1.247 Perms
08	System Performance	ANSI A118.10, ASTM C627	Cycles 1-14 - Heavy Duty

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate work with other trades (plumbing and tile) as required for proper installation of shower stall waterproofing.

B. Surface temperature must be 50°F to 90°F (10°C to 32°C) during application and for 24 hours after installation.

C. All substrates must be structurally sound, clean and free of dirt, oil, grease, paint, laitance, efflorescence, concrete sealers or curing compounds.

D. Make rough or uneven concrete smooth to a wood float or better finish with a LATICRETE underlayment. Do not level with gypsum or asphalt-based products.

E. Maximum deviation in plane must not exceed 1/4" in 10 ft (6 mm in 3 m) with no more than 1/16" in 1 ft (1.5 mm in 0.3 m) variation between high spots.

F. Dampen hot, dry surfaces and sweep off excess water—installation may be made on a damp surface.

G. New concrete slabs shall be damp cured and a minimum of 14 days old before application.

3.2 INSTALLATION

A. Locations: Install under conventional tile in the shower stalls.

B. Pretreat all cracks, floor-to-wall transitions, penetration and floor drains with reinforcing fabric per manufacturer's standards and recommendations.

C. Reinforcing fabric shall be a minimum 5" wide; and wider where applicable to the condition.

D. Install reinforcing fabric in continuous lengths for the applicable condition / joint.

E. Allow any pre-treated areas to dry to the touch.

F. Apply a liberal coat of liquid membrane material with brush or roller over substrate including pre-treated areas.

G. Apply another liberal coat of liquid membrane material over the first coat.

H. Let topcoat dry to the touch, approximately 1–3 hours at 70°F (21°C) and 50% RH; or as recommended by the manufacturer.

I. When last coat has dried to the touch, inspect final surface for pinholes, voids, thin spots or other defects. Use additional liquid membrane material to seal defects.

J. All coat thicknesses and finished application thickness shall as recommended by the manufacturer; but in no case shall be less than 0.030".

K. Prior to completion, coordinate with tiling contractor to inspect the installation for acceptability for their work to proceed. Repair and / or replace areas that are not acceptable.

L. The completed installation shall form a continuous, waterproof membrane at ceramic tile substrates throughout the entire shower stall.

END OF SECTION

SECTION 07 17 16

BENTONITE COMPOSITE SHEET WATERPROOFING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 The work includes furnishing labor, materials and installation of below grade waterproofing for elevator pits, and any other recessed slab areas indicated on the Drawings.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 07 13 53 – Elastomeric Sheet Waterproofing
   03 Section 31 20 00 – Earth Moving
   04 Section 31 23 33 – Trenching and Backfilling

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Warranty: Submit specimen of manufacturer's standard warranty.

1.3 REFERENCES

A. U.S. Army Corps of Engineers, CEGS-07111 Elastomeric Membrane Waterproofing.

B. Federal Construction Guide Specification, FCGS-07111, Elastomeric Waterproofing.

C. ASTM Standards as listed in specification below.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide Geotextile / Bentonite Clay waterproofing membrane produced by a manufacturer with a minimum of five (5) years of experience in the waterproofing industry.

B. Installer: A firm with a minimum of two (2) years of experience in installing bentonite clay or other related waterproofing products.

1.5 WARRANTY

A. Upon completion and acceptance of the work required by this Section, the manufacturer will issue a warranty agreeing to promptly replace defective materials for a period of five (5) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of bentonite composite sheet waterproofing is based on products manufactured by Carlisle Coatings & Waterproofing Inc.

B. The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
01 Cetco – Volclay
02 Tremco

2.2 PRODUCTS

A. Design of bentonite composite sheet waterproofing is based on Carlisle Coatings & Waterproofing Inc. MiraCLAY.

B. Physical Properties for CCW MiraCLAY Bentonite Clay Waterproofing Membrane:

Property	Test Method	Value
Bentonite Content	—	1.0 lb./ft^2 (.488 kg/m^2) @ 12% MC
Nominal Dry Thickness	—	0.25 in. (6.4 mm)
Weight	—	75 lb. (34.05 kg)
Permeability	ASTM D5084	5 x 10^{-9} cm/sec
Grab Tensile Strength	ASTM D4632	95 lb. (422 N)
Grab Elongation	ASTM D4632	150%
Puncture Resistance	ASTM D4833	120 psi (828 kPa)
Hydrated Internal Shear	ASTM D5321	500 psf (24 kPa)
Swell Index	ASTM D5890	2g (24 ml) min.
Fluid Loss	ASTM D5891	18 ml max

C. Waterproofing system accessories supplied by waterproofing membrane manufacturer:
01 Mastic: CCW MiraCLAY Mastic is used for detailing at terminations and penetrations. Also used to fill minor voids in concrete and as a fillet in angle changes.
02 Granules: CCW MiraCLAY Granules used for horizontal to vertical transitions and for detailing at seams and slab penetrations.
03 Water Stop: CCW MiraSTOP used as a water stop at cold concrete pours, shotcrete cold joints and between pre-cast concrete panels.

D. Membrane to Substrate Fasteners: Fasteners, of the type and length suitable for the substrate, shall be used in conjunction with washers, of at least 1” diameter, to attach the geotextile/bentonite clay waterproofing membrane to the substrate.

E. Membrane to Membrane Fasteners: Mechanically fasten membrane sheets together with a box-stapler or similar device for horizontal applications.

F. The Geotextile/Bentonite membrane shall consist of geotextile panels of sodium bentonite clay sandwiched between two layers of needle-punched woven and non-woven polypropylene fabrics.

G. Drainage Composite: Shall be CCW MiraDRAIN® as recommended by the manufacturer for each condition.

H. Perimeter Drainage System: Where required shall be CCW QuickDRAIN™.

I. Protection Board - .125-inch minimum thickness as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrate and condition under which waterproofing will be installed. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Grade Substrates: Shall be level and uniform that is compacted to a minimum of 85% modified proctor.

B. Concrete Application:
   01 Apply CCW MiraCLAY Mastic to all construction joints at a minimum of 1/4" (7mm) thickness and a 3" (8cm) minimum width.
   02 Remove projections from the wall surface in excess of 3/4" (20mm).

C. Honeycombing, voids and aggregate pockets exceeding 1 inch in diameter or have a depth greater than 3/4 inch should be filled with a non-shrink cementitious grout. Fill tie-rod holes with a non-shrink cementitious grout.

3.3 INSTALLATION

A. Prevent geotextile/bentonite clay waterproofing membrane from hydrating before being covered with overburden. When threat of rain is imminent or backfill is not immediate, geotextile/bentonite clay waterproofing membrane should be covered with polyethylene sheeting.

B. Under Slab Application: (Concrete slab shall have a minimum thickness of 4" if reinforced or 5” if not reinforced).
   01 Install CCW MiraCLAY with the white non-woven side up, facing the installer.
   02 Overlap edges a minimum of 4” (10cm).
   03 Protect CCW MiraCLAY from damage caused by chairs with sharp edges or points by placing a patch of CCW MiraCLAY under the chair.
   04 Staple joints often enough to prevent excessive movement.

05 Pour CCW MiraCLAY Granules or trowel CCW MiraCLAY Mastic around all penetrations and press in “cut to fit” collars of CCW MiraCLAY.
06 Extend the installation of CCW MiraCLAY 12" (31cm) up or beyond the perimeter slab forms.
07 Inspect and repair any damaged material before concrete pour.

C. Concrete Wall Application:
01 Install CCW MiraCLAY with the white non-woven side out, facing the installer.
02 Starting at the bottom of the wall, unroll CCW MiraCLAY and nail across top of panel one nail per 12" (31cm) on center. Allow sheet to hang down nailing only as required to stabilize.
03 Install adjacent membrane by overlapping edges a minimum of 4” (10cm).
04 Fasten membrane once every 18” (45cm) on seams or as required to prevent blousing with 3/4” (20mm) to 1” (25mm) concrete nails with washers.
05 Extend waterproofing membrane to 6-inches below grade and fasten membrane to the substrate to maintain constant compression using a 1/8” X 1” (3 X 25 mm) minimum termination bar. Trowel a 1/2” (12mm) thick and 2” (5cm) wide bead of CCW MiraCLAY Mastic at top edge of membrane and cover termination bar.
06 Create a cant at any vertical to horizontal transition by applying a 1.5” to 2” (4cm to 5cm) cant of CCW MiraCLAY Granules or CCW MiraCLAY Mastic.
07 Strip in all corners and transitions with a 12" to 15" (31cm to 39cm) piece of CCW MiraCLAY membrane to double cover these areas.
08 Backfill must be compactable soils free of construction debris and must be uniformly compacted to a minimum 85% Modified Proctor on each lift.

3.4 PROTECTION AND DRAINAGE

A. Protect the geotextile/bentonite clay waterproofing membrane with CCW MiraDRAIN Drainage Composite as recommended by the manufacturer for the specific installation requirements of the project

B. Install the CCW MiraDRAIN Drainage Composite as recommended by the manufacturer for the specific installation requirements of the project.

3.5 BACKFILL

A. Backfill with smooth and uniform material with no sharp projections or stones larger than ¾-inch. Compact backfill to an 85% Modified Proctor. Insure backfill material is not contaminated with salt or other materials that could prevent the CCW MiraCLAY from hydrating.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all thermal batt / roll insulation within stud cavity at light gauge metal framed exterior walls and building envelope.
   02 Provide acoustical sound attenuation insulation at interior partition cavities where indicated on the Drawings.
   03 Provide rigid foam insulation on all exterior CMU back-up walls.
   04 Provide rigid foam insulation on sheathing of all exterior light gauge metal framed walls.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 05 41 00 – Structural Metal Stud Framing
   03 Division 7 – Roofing
   04 Section 07 25 00 – Weather Barrier
   05 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Sample / Mock-Up Panel: Sample / mock-up panel shall be 8' long x 6' high panel showing selected color range and texture, bonding, mortar color, joint shape, and quality workmanship. Include a brick expansion joint. Sample panel shall remain at the jobsite until all masonry is completed.
   01 Panel shall be "L" shaped (4' x 4') with metal stud / drywall back-up wall on one side and CMU back-up on one side. Coordinate as required with other trades.
   02 Once accepted by the Architect, the sample panel shall be the standard by which installed is judged.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   01 ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board.
   02 ASTM C272 – water Absorption of Core Materials for Structural Sandwich Constructions.
   03 ASTM C518 – Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   04 ASTM C578 – Rigid, Cellular Polystyrene Thermal Insulation.
   05 ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   06 ASTM D1621 – Compressive Properties of Rigid Cellular Plastics.
   07 ASTM D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
   08 ASTM D1929 – Standard Test Method for Determining Ignition Temperature of Plastics.
   09 ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
   10 ASTM E96 – Water Vapor Transmission of Materials.

B. Underwriters Laboratory (UL):
   01 UL 723 – Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association (NFPA):
   02 NFPA 259 – Standard Test Method for Potential Heat of Building Materials.
   03 NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

PART 2 - PRODUCTS

2.1 MATERIALS – BATT OR ROLL - THERMAL

A. Design of batt or roll thermal insulation is based on products manufactured by Owens-Corning.

B. The following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Certainteed
   02 Guardian Building Products

03 Johns Manville
04 Knauf Insulation
05 United States Gypsum

C. Design of batt or roll thermal insulation is based on Owens-Corning Eco-Touch Unfaced Insulation.

D. Batt or Roll Thermal Insulation:
01 Inorganic glass fiber, flexible, unfaced insulation.
02 R-Values: minimum R+19 at exterior walls at light gauge steel framed walls.
03 Comply with Type 1 ASTM 665-84 unfaced.
04 Flame Spread 25 or less.
05 Provide in widths to match spacing of light gauge steel framing.
06 Pins and disc securement accessories. Provide a minimum of two (2) pins at the top of each section of insulation to prevent sagging.

2.2 MATERIALS – BATT OR ROLL - ACOUSTICAL

A. Design of batt or roll acoustical insulation is based on products manufactured by Owens-Corning.

B. The following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
01 Certainteed
02 Guardian Building Products
03 Johns Manville
04 Knauf Insulation
05 United States Gypsum

C. Design of batt or roll acoustical insulation is based on Owens-Corning Sound Attenuation Batts 150 Insulation.

D. Batt or Roll Acoustical Insulation:
01 Unfaced inorganic glass fiber or mineral wool insulation specifically designed for noise control.
02 Thickness: 2” minimum.
03 Rating in typical 3-5/8” stud wall with 1 layer 5/8” gyp board each side: 47 STC minimum; 0.95 NRC.
04 Flame Spread: 25 or less.
05 Pins and disc securement accessories. Provide a minimum of two (2) pins at the top of each section of insulation.

2.3 MATERIALS – CONTINUOUS RIGID INSULATION

A. Design of continuous rigid insulation is based on products manufactured by Atlas Roofing.

B. The following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
01 Dow Chemical Co.
02 Johns Manville
03 Owens-Corning
04 Pactiv / Green Guard
05 Rmax

C. Metal Panel Veneers: Design of continuous rigid insulation is based on Atlas Roofing Energy Shield Pro Rigid Insulation.
   01 This product shall be used behind all metal panel veneer walls.
   02 Closed cell, polyisocyanurate (polyiso) foam core faced with a reflective 12 mil reinforced foil facers on one side and a white 12 mil reinforced acrylic-coated aluminum facer on the other.
   03 Classified Type X in accordance with ASTM C578.
   04 Certified to comply with NFPA 285 in assemblies shown.
   05 Minimum thickness: 1-1/2”
   06 Aged thermal resistance: R-5.0 per inch minimum.
   07 Flame Spread: Class A flame spread, <25 ASTM E84.
   08 Smoke Development: <450 ASTM E84.
   09 Size at light gauge steel framed back-up walls: 4’ x 8’ sheet size. Minimize joints as much as practical.
   10 CMU back-up walls: Width to fit between vertical spacing of masonry reinforcement.

D. Masonry / Stone Veneers: Design of continuous rigid insulation is based on Atlas Roofing Energy Shield CGF Rigid Insulation.
   01 This product shall be used behind all masonry / stone veneer walls.
   02 Closed cell, polyisocyanurate (polyiso) foam core faced with a reflective 12 mil reinforced foil facers on one side and a white 12 mil reinforced acrylic-coated aluminum facer on the other.
   03 Classified Type X in accordance with ASTM C578.
   04 Certified to comply with NFPA 285 in assemblies shown.
   05 Minimum thickness:
   06 Aged thermal resistance: R-5.0 per inch minimum.
   07 Flame Spread: Class A flame spread, <25 ASTM E84.
   08 Smoke Development: <450 ASTM E84.
   09 Water vapor transmission: 0.1 perm maximum.
   10 Size at light gauge steel framed back-up walls: 4’ x 8’ sheet size. Minimize joints as much as practical.
   11 CMU back-up walls: Width to fit between vertical spacing of masonry reinforcement.

E. Rigid Board Insulation Adhesive:
   01 Provide manufacturer’s recommended adhesive for substrate being applied.
   02 Verify compatibility with weather barrier materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Batt or Roll Thermal Insulation:
   01 Batts shall fit between studs and provide full coverage at exterior building envelope.
   02 Install in continuous lengths wherever possible.
   03 Install adhesive-mounted spike devices with metal caps at 2'-0" vertically, and 4 inches horizontally from each side of the blanket.
   04 Install blankets with long dimensions running vertically on spikes, keeping blankets tight to exterior wall without crushing.
   05 On the exterior side of all structural steel located directly behind sheathing.

B. Batt or Roll Acoustical Insulation:
   01 Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.
   02 Install in continuous lengths wherever possible.
   03 Install adhesive-mounted spike devices with metal caps at top of each blanket, and 4 inches horizontally from each side.
   04 Suspend blankets 1” above finish floor.

C. Rigid Board Insulation:
   01 Install board insulation at exterior masonry walls between masonry reinforcement in accordance with manufacturer’s printed instructions. Do not bend or alter masonry ties to secure rigid insulation in place.
   02 Install board insulation on dampproofed sheathing at all light gauge steel framed walls.
   03 Secure insulation boards to back up surface with manufacturer’s recommended adhesive that is compatible with weather barrier product.
   04 Install with joints tight to provide full coverage.
   05 Cope / cut insulation to fit irregularities, masonry ties and obstructions as required to achieve full coverage.
   06 Take precautions to assure that insulation board is concealed within cavity wall construction.

3.2 PROTECTION

A. Upon completion of batt insulation, use all means necessary to protect material from becoming wet.
   01 In the event batt or acoustical insulation comes in direct contact with moisture or becomes wet, remove and discard, and replace insulation with dry material.
   02 In the event batt insulation becomes damp or moist, thoroughly dry insulation prior to covering up.
   03 Use all means necessary to assure that batt and acoustical insulation is completely dry at the time of cover-up and will not promote the growth of mold.

B. Protect rigid insulation as required to prevent damage and delamination.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIER

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: Provide a complete integrated system of components specifically designed to provide a complete fluid-applied membrane weather barrier at the building envelope walls. System shall include:
   01 Fluid-applied membrane weather barrier suitable for application on masonry and gypsum board substrates.
   02 Joint reinforcement, tape, compound and treatment.
   03 Elastomeric flashing.
   04 Sealant.
   05 Adhesives and Primers.
   06 Other components as required for a complete installation as recommended by the manufacturer.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 05 41 00 – Structural Metal Stud Framing
   03 Section 06 10 00 – Rough Carpentry
   04 Section 07 21 00 – Thermal Insulation
   05 Section 07 65 26 – Self-Adhering Sheet Flashing
   06 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit Shop Drawings showing:
   01 Locations and extent of vapor permeable air barrier assemblies.
   02 Details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged.
   03 How inside and outside corners are negotiated, how materials that cover the vapor permeable air barrier are secured with air-tight condition maintained.
   04 How miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Submit documentation from an approved independent testing laboratory certifying the air leakage rates of the air barrier membranes assembly, including primary membrane, primer and sealants have been tested to meet ASTM E2357.

F. Submit documentation from an approved independent testing laboratory certifying the air leakage and vapor permeance rates of the air barrier membranes, including primary membrane and transition sheets, exceed the specified requirements and in accordance with ASTM E2178.
   01 Test report submittals shall include test results on porous substrate and include sustained positive and negative wind load and gust load air leakage results.

G. Manufacturer Certifications signed by manufacturer:
   01 Certifying their review of the project Shop Drawings and that the air barrier system complies with specified requirements.
   02 Certification of compatibility with specified rigid insulation, Section 07 21 00 – Thermal Insulation and Section 07 65 26 – Self-Adhering Sheet Flashing.

H. Manufacturer's Field Service:
   01 Provide site reports from authorized field service representative, indicating observation of fluid-applied membrane air barrier system installation.
   02 Reports shall be required on a weekly basis (minimum) throughout the installation phase(s).
   03 Following completion of Work, submit manufacturer's report of final inspection and acceptance of completed installation.

I. Sample / Mock-Up Panel: Sample / mock-up panel shall be 8' long x 6' high panel showing selected color range and texture, bonding, mortar color, joint shape, and quality workmanship. Include a brick expansion joint. Sample panel shall remain at the jobsite until all masonry is completed.
   01 Panel shall be "L" shaped (4' x 4') with metal stud / drywall back-up wall on one side and CMU back-up on one side. Coordinate as required with other trades.
   02 Once accepted by the Architect, the sample panel shall be the standard by which installed is judged.

J. Operations and Maintenance Manuals:
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to Section 01 78 23 – Operations and Maintenance Manuals.
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

K. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   01 AMMA 2400-02, Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction.

B. American Society for Testing and Materials (ASTM):
   01 ASTM D412 – Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
   02 ASTM D471, Standard Test Method for Rubber Property - Effect of Liquids.
   03 ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   04 ASTM D2243 – Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings.
   05 ASTM D5590 – Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay.
   06 ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
   07 ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
   08 ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
   09 ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
   10 ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
   11 ASTM E1354 – Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter.
   12 ASTM E1677 – Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.
   13 ASTM E2112 – Standard Practice for Installation of Exterior Windows, Doors and Skylights.
   14 ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.
   15 ASTM E2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

C. National Fire and Protection Agency (NFPA):
   01 NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

1.4 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Manufacturer shall demonstrate a minimum of ten (10) years of experience in fluid-applied membrane air barriers.

B. Applicator Qualifications:
   01 The applicator of the fluid-applied membrane air barrier material specified herein shall be a manufacturer’s licensed / authorized applicator.
   02 Applicator shall have a minimum of five (5) years of experience in the application of fluid-applied membrane air barrier.

C. Source Requirements: Obtain primary materials from a single manufacturer regularly engaged in manufacturing vapor permeable air barrier materials. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

1.5 WARRANTY

A. Warranty:
   01 Manufacturer's standard warranty for fluid-applied membrane weather barrier for a period of ten (10) years.
   02 Warranty Areas: Warranty shall cover all vertical surfaces receiving the fluid-applied membrane weather barrier materials – field surfaces, joints flashings.
   03 Coordinate with manufacturer for on-site observations and requirements for issuance of warranty.

B. Installation Warranty: Provide air barrier subcontractor's five (5) year warranty, including all components of the weather barrier assembly, against failures including loss of airtight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Fluid Applied Weather Barrier is based on products manufactured by Henry Company.

B. The following manufacturers are acceptable for use for this Section, provided all specified requirements are met or exceeded.
   01 Dupont
   02 W.R. Meadows
   03 Poly-Guard
   04 Prosoco
   05 Tremco

2.2 PRODUCTS

A. Design of Fluid Applied Weather Barrier is based on the following Henry Company products:
   01 Henry Air-Bloc 17MR Fluid Applied, Vapor Permeable Air & Water Barrier Membrane.
   02 Henry HE925 BES Sealant and Joint Treatment.
   03 Henry Adhesives and Primers.
   04 Henry Air-Bloc 21 Insulation Adhesive (refer to Section 07 21 00 – Thermal Insulation).
   05 Henry Blueskin SA Flashing (refer to Section 07 65 26 – Self-Adhering Sheet Flashing).
   06 Henry Blueskin TWF Thru-wall Flashing (refer to Section 07 65 26 – Self-Adhering Sheet Flashing).

B. Henry Air-Bloc 17MR Fluid Applied, Vapor Permeable Air & Water Barrier Membrane. One-component, water-based, elastomeric emulsion membrane, designed to provide a vapor permeable air and water barrier when applied above-grade wall assemblies, having the following properties:
   01 Solids Content:
      a. By Weight: 63%.
      b. By Volume: 53%.
   02 Service Temperature:
      a. Low Temperature: -40°F (-40°C).
      b. High Temperature: +180°F (+80°C).

03 Application Temperature:
   a. Low Temperature: +20°F (-6°C).
   b. High Temperature: +122°F (+50°C).
04 Tensile Strength (ASTM D412): 104 psi (717 kPa).
05 Elongation (ASTM D412): 420%.
06 Low Temperature Flexibility @ -22°F (-30°C) (ASTM D1970): Pass.
07 Freeze-Thaw Resistance (ASTM D2243): Pass; 10 cycles.
08 Nail Sealability (ASTM D1970): Pass.
09 VOC Content: 100 grams/liter max.
10 Water Absorption (ASTM D471, modified): 5.6%.
11 Water Vapor Permeance (ASTM E96 B) @ 40 mils nominal dry film: 14 perms.
12 Air Permeability:
   a. Assembly Air Leakage (ASTM E2357): Pass.
   b. Building Material (ASTM E2178): 0.0001 cfm/ft2 (0.0005 L/s.m2).
13 Chemical Resistance: Resists salt solutions, mild acids and alkalis. Non-resistant to oils, grease or solvents.
14 Fire Testing (NFPA 285): Complies in various assemblies.
15 Flame Spread/Smoke Development (ASTM E84): 10/15.
16 Resistance to Mold, Mildew, and Fungal Growth (ASTM D5590): No growth.

C. Design of building envelope and sheathing joint sealant is based on Henry HE925 BES Sealant: Moisture cure, medium modulus polymer modified sealing compound, having the following properties:
01 Complies with Fed. Spec. TT-S-00230C, Type II, Class A.
02 Complies with ASTM C920, Type S, Grade NS, Class 35.
03 Elongation: 450 – 550%.
04 Remains flexible with aging.

D. Design of rigid insulation adhesive is based on Henry Air-Bloc 21 Insulation Adhesive: Synthetic trowel applied rubber-based adhesive having the following characteristics:
01 Compatibility: With air barrier membrane, substrate and insulation.
02 Air leakage: 0.0026 CFM/ft^2 @ 1.6 lbs./ft^2 to ASTM E283.
03 Water vapor permeance: 0.03 perms to ASTM E96.
04 Long term flexibility: CGSB 71-GP-24M.

E. Other materials and accessories as recommended by the manufacturer to provide an integrated, compatible weather barrier system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Substrate Conditions:
01 Verify substrates to receive work and surrounding adjacent surfaces are in accordance with Air Barrier Manufacturer published literature prior to installation of fluid applied membrane air barrier assembly.
02 Sheathing panels must be securely fastened and installed flush to ensure a continuous substrate in accordance with Air Barrier Manufacturer published literature.
03 Fastener penetrations must be set flush with sheathing and fastened into solid backing.

04 Mortar joints in concrete block and form tie holes/voids in poured concrete shall be filled, flush, smooth, and allowed to be cured for a minimum of twenty-four (24) hours.

05 Cap and protect exposed back-up walls against wet weather conditions prior to application of fluid applied membrane air barrier assembly.

B. Notify Contractor in writing of any conditions that are not acceptable.

C. The installing Contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this Section in accordance with published literature. Commencement of Work or any parts thereof shall mean installer acceptance of the substrate.

3.2 PREPARATION

A. All surfaces must be sound, dry to touch, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.

B. Protect adjacent surfaces not included in scope of Work to prevent spillage and overspray.

C. Hot weather or direct-sun applications over porous substrates, such as concrete, promote rapid surface drying and can form blisters in the fluid applied membrane air barrier during curing. To aid in blister prevention prepare substrate in accordance with one of the following optional procedures:

01 Prime coat:

a. Apply a thin prime coat of fluid applied membrane air barrier to substrate.

b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.

c. Install primary fluid applied membrane air barrier to Air Barrier Manufacturer minimum recommended mil thickness.

02 Two coat:

a. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.

b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.

c. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.

d. Overall dry mil thickness shall be in accordance with Air Barrier Air Barrier Manufacturer published literature.

3.3 INSTALLATION

A. Ensure substrate is ready to receive fluid applied membrane air barrier in accordance with published literature.

B. If fluid applied membrane air barrier should freeze while in storage, move containers to a controlled environment above 32°F (0°C) until thawed and re-mix using a hand operated power mixer prior to use.

C. Fluid applied membrane air barrier shall not be applied when ambient (air) and substrate temperatures are below 20°F (-6°C).

D. Do not proceed with application of air barrier membrane when rain is expected within 16 hours.

E. Apply sealant at sharp corners, changes in substrate plane, penetrations, and edges to form a smooth transition from one plane to another.

F. Non-Moving Substrate Joint and Crack Treatment:
   01 Gaps at sheathing joints or openings through sheathing - equal to or less than 3/8 inch (10 mm) wide:
   02 Sheathing Joint Sealant:
      a. Apply sealant at rate recommended by Air Barrier Manufacturer.
      b. Spread sealant at joint extending a minimum one (1) inch beyond gap to ensure a continuous air and watertight assembly.
   03 For all gaps in excess of 3/8", seal in strict accordance with manufacturer's standards and recommendations for the specific condition.

G. Refer to Air Barrier Manufacturer Detail Drawings for installation procedures including, but not limited to, the following:
   01 Inside corners.
   02 Outside corners.
   03 Crack treatment.
   04 Penetrations.
   05 Rough openings.
   06 Control joints.
   07 Expansion joints.
   08 Changes in substrate.

H. Contact Air Barrier Manufacturer to coordinate transition of fluid applied membrane air barrier to adjacent areas including, but not limited to, the following:
   01 Roof to air barrier.
   02 Air barrier to waterproofing.
   03 Fastener penetrations.

I. Thru-Wall Flashing: Coordinate with Section 07 62 23 – Thru-Wall Flashing and Section 07 65 26 – Self-Adhering Sheet Flashing.

J. Primary Liquid Air Barrier Membrane:
   01 Install fluid applied membrane air barrier in accordance with Air Barrier Manufacturer published literature to ensure an air and watertight fluid applied membrane air barrier assembly.
   02 Fluid applied membrane air barrier assembly must be installed in a monolithic application without sags, runs or voids, and transitioning with auxiliary components to create a uniform drainage plane and air barrier.
   03 Install fluid applied membrane air barrier and transition membranes so that subsequent membrane installation laps one (1) inch (2.5 cm) onto existing membrane ensuring an air and watertight fluid applied membrane air barrier assembly.
   04 Fluid applied membrane air barrier total dry thickness shall be in accordance with Air Barrier Manufacturer published literature. Refer to Air Barrier Manufacturer Technical Data Sheet.

K. Insulation Adhesive: Coordinate with other trades as required.
   01 Coordinate with Section 07 21 00 – Thermal Insulation for insulating materials.
   02 Upon curing of the air barrier membrane system apply insulation adhesive in a serpentine pattern.
   03 Immediately embed insulation into the adhesive and press firmly into place to ensure full contact. Apply additional adhesive if allowed to skin over.
   04 Fully butter all joints of insulation panels with adhesive during installation, with the exception of expansion joints.

3.4 FIELD QUALITY CONTROL

A. Final Observation and Verification:
   01 Prior to covering completed weather barrier work, final inspection of fluid applied membrane air barrier assembly shall be carried out by the Architect, the Contractor, and Air Barrier Manufacturer as required by warranty.
   02 Contact Air Barrier Manufacturer for warranty issuance requirements.

B. Fluid applied membrane air barrier assembly is not designed for permanent UV exposure. Refer to Air Barrier Manufacturer published literature for product limitations.

3.5 CLEANING

A. Promptly as the Work proceeds, and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.

B. Clean soiled surfaces, spatters, and damage caused by Work of this Section.

C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

END OF SECTION

SECTION 07 41 13

METAL ROOF PANELS

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 The work includes furnishing labor, materials and installation of pre-finished metal panel roofing, trim, flashing, and miscellaneous parts as indicated on Drawings and described herein.
   02 The work also includes roof deck system below metal roofing consisting of rigid insulation boards, plywood decking and waterproofing underlayment.

C. Related Work:
   01 Section 05 31 00 – Steel Decking
   02 Section 06 10 00 – Rough Carpentry
   03 Section 07 21 00 – Thermal Insulation
   04 Section 07 42 13 – Metal Wall Panels
   05 Section 07 62 00 – Sheet Metal Flashing
   06 Section 07 72 00 – Roof Accessories

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: To be prepared by metal roof system manufacturer shall include layouts of panels, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashing, closures and special details. Distinguish between factory and field assembly work.
   01 Provide metal roof flashing, gutter and downspout Shop Drawings. Indicate gauge and finish of material, fastener type, finish and spacing, locations of field applied sealant, and location size and gauge of all back up plates.

02 Roof Panel Attachment:

a. Roof plan with wind uplift pressure calculations at field, corner and perimeter areas according to version of ASCE-7 referenced by locally-adopted Building Code and the authority having jurisdiction.

b. Roof plan indication roof clip spacing pattern at field, corner, perimeters and where panels are to be fixed from thermal movement.

c. Roof panel attachment plan must be stamped by licensed engineer in State in which project is constructed, certifying roof attachment meets local Building Code requirements for wind uplift.

D. Engineering Calculations: Submit wind uplift pressure calculations according to ASCE 7 Wind Speed for project location with respect to appropriate Importance Factor, Exposure category and Safety Factor. Calculations shall be sealed by a Professional Engineer licensed to practice structural engineering in the state in which project is located.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.

01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

F. Samples:

01 Color charts or samples from the manufacturers standard line of Kynar 500 finishes for Architect's selection.

02 Sample of 12" long, full width coated panel showing metal gauge, seam and required finish.

03 Two samples of roof panel clip, clip fastener, bearing plate, and spacer block.

G. Submit sample warranties:

01 Coating Warranty.

02 Manufacturer Water Tightness Warranty complying with this Specification.

03 Installer Warranty.

H. Certification:

01 Submit roof panel manufacturer's certification that fasteners, clips, backup plates, closures, roof panels and finishes meet specification requirements, wind uplift requirements.

02 Submit roof panel manufacturer's certification that installer meets requirements to install roof system and is qualified to obtain required warranties.

03 Uplift Test Reports –Certified test results that indicate roof system meets or exceeds design and performance criteria. Testing to include:

a. Underwriters Laboratory: Submit documentation that panel System has been tested at Underwriters Laboratories per UL-580 and be currently listed under a UL Construction Number. Submit documentation that panel system has been tested in accordance with UL-580/1897 and has been tested to failure.

b. ASTM E 1592. Submit ASTM E 1592 Test reports prepared by independent test laboratory and stamped by a professional

engineer substantiating that roof system will meet the allowable wind pressures with a safety factor of 2.0.

04 Static Water Testing Certification:

a. The panel system shall be tested in accordance with FM4471 Appendix G, and pass with no leakage. The test specimen must successfully withstand being submerged under 6" of water for a minimum period of 7 days.

b. The panel system shall be tested in accordance with ASTM E2140- and pass with no leakage. The test specimen must successfully withstand being submerged under 6" of water for a minimum period of 6 hours.

05 Air and Water Testing Certification:

a. ASTM E1680 – Manufacturer's test data for air infiltration rates up to 20 pounds per square inch differential pressure.

b. ASTME1646- Manufacturer's test data for water infiltration rates up to 20 pounds per square inch differential pressure.

06 Impact Resistance: Submit documentation that panel system has been tested at Factory Mutual per FM 4471 Section 4.5 and is currently rated for "Severe Hail".

I. Operations and Maintenance Manuals:

01 Provide complete operations and maintenance manuals to the Owner.

02 Refer to Section 01 78 23 – Operations and Maintenance Manuals.

03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

1.3 REFERENCES

A. ASTM International:

01 ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

02 ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

03 ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

04 ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

05 ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

06 ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.

07 ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.

08 ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

09 ASTM E 1514 - Standard Specification for Structural Standing Seam Steel Roof Panel Systems.

10 ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

11 ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.

12 ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

13 ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

B. Factory Mutual: 4471 Approval Standard for Class 1 Panel Roofs:
01 Section 4.1 Combustibility-From Below Roof Assembly.
02 Section 4.2 Combustibility-From Above Roof Assembly.
03 Section 4.3 Wind Uplift Resistance.
04 Section 4.4 Foot Traffic Resistance.
05 Section 4.5 Hail Damage Resistance.
06 Appendix G- Susceptibility to Leakage Test Procedure for Class 1 Panel Roofs.

C. SMACNA: Architectural Sheet Metal Manual, Latest Edition.

D. American Society of Civil Engineers (ASCE):
01 ASCE -7 - Minimum Design Loads for Buildings and Other Structures, version adopted by local Building Code authority having jurisdiction.

E. Building Code – as approved by local authority having jurisdiction.

1.4 DESIGN AND PERFORMANCE CRITERIA

A. Thermal Movement: Metal Roofing system, including flashing, shall accommodate unlimited thermal movement without buckling or excess stress on the structure.

B. Roof panel and trim attachments will be designed to satisfy the requirements of the roof design (shown in Shop Drawings).

C. Maximum wind uplift capacity of roof system shall be determined using certified results from UL 1897-98, Uplift Tests for Roof Covering Systems. Testing of the entire roof assembly shall be conducted in a UL-580 test chamber.

D. Panel system installation shall be in accordance with ASCE 7 Wind Speeds for project location with respect to appropriate Exposure category, Building Importance Factor and a Safety Factor of 2.0.

1.5 QUALITY ASSURANCE

A. Manufacturer: Manufacturer's facility and equipment must undergo an annual quality assurance audit by Factory Mutual. This assures that manufacturer's equipment, procedures and quality program are maintained to insure a uniform product consistent with that which was tested and FM Approved.

B. Installer of pre-formed metal roofing shall be experienced in the work and shall have no fewer than five (5) years of successful experience with installation metal roof systems similar to those required for this Project, and is qualified by the roof panel manufacturer, for installation of manufacturer-warranted systems.

C. Field Measurements: Prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units, where final dimensions cannot be established prior to fabrication.

D. Install a 30-foot wide, quality control area of metal roofing, for review by the Architect, to establish the quality of installation for the roof, and have approved prior to installing additional metal panels.

1.6 COORDINATION

A. Coordinate Work, with installation of other associated Work, to ensure quality application.

B. Coordinate Work with installation of associated metal flashings and building walls.

C. Coordinate Work to minimize foot traffic and construction activity on installed finished surfaces.

D. Coordinate location of pipe penetrations to allow centering of pipe in panel.

E. Coordinate location of roof curbs, to allow proper integration with roof panel seams.

1.7 WARRANTY

A. Panel Coating: Furnish manufacturer's twenty (20) year panel coating warranty covering against becoming unserviceable or causing an objectionable appearance resulting from either defective or non- conforming materials and workmanship. Defects shall include but not be limited to the following:
   01 Leaking, checking, crazing, chalking, fading, and adhesion.
   02 Cracking, chipping or peeling of finish.
   03 Wrinkling, undue expansion, lifting, loosening, and splitting seams.

B. Provide manufacturer’s twenty (20) year durability warranty against rupture, structural failure and perforation due to corrosion, and against chalking, cracking and peeling.

C. Provide manufacturer's twenty (20) year No Dollar Limit warranty for weather-tightness. Weather-tightness warranty shall include labor and materials and shall apply to the roof system specified including related flashings, valleys, ridges, roof panels, roof penetrations, roof curbs, and trim.
   01 Warranties supplied by Metal Roof Installer or 3rd Party Warranties are not acceptable.

PART 2 - PRODUCTS

2.1 METAL ROOF PANELS

A. The design of metal roof panels is based on products manufactured by Rollfab Metal Products..

B. Other acceptable manufacturers: The following manufacturers are acceptable to provide metal roofing panels, provided the proposed products meet or exceed all specified requirements.
   01 Atas International
   02 Berridge Manufacturing Co.
   03 Englert, Inc.
   04 Garland Company, Inc.
   05 Imetco
   06 MBCI

07 McElroy Metal

C. Basis of Design: Rollfab Metal Products MS-200HP Mechanical Standing Seam Metal Roof Panels.
01 Tested in accordance with ASTM E 1646 and E 1680 for water penetration and air infiltration, and per ASTM E1592 for wind uplift capacity.
02 Panels to be installed on a flat substrate shall be factory formed.

D. Panel Substrate: Galvalume coated sheet steel, Type AZ-50, Grade 50 as described in ASTM A792; minimum 22 gauge.

E. General: A mechanically seamed pan-type standing seam roof panel with concealed clips.
01 Panels shall be field seamed 180 degrees.
02 Panels must be furnished and installed in continuous lengths from ridge to eave with no endlaps.
a. Panels too long to ship will be manufactured on site using manufacturer's employees and equipment.
03 Panels to be installed on a curved substrate shall be field formed in continuous lengths.

F. Physical Characteristics:
01 Gauge: Minimum 24; provide 22 gauge where required to meet wind load requirements.
02 Width: 18" coverage per panel.
03 Seam Height: 2".

G. Panel Clips:
01 Clips: Floating type.
02 Clips used to attach panel to substrate shall provide minimum 3/8" air space between panel and roof deck to reduce heat transfer into the building envelope.
03 Provide manufacturer's standard profiles, gauge(s) and spacing as required to meet wind load requirements.

H. Characteristics:
01 All panels shall be symmetrical in design and shall be mechanically seamed with a field operated electric seaming machine provided by the manufacturer.
02 Seam cap matching panel finish with two rows of integral factory hot applied sealant.
03 Manufacturer watertightness warranty, meeting requirements of this Section.

I. Finish:
01 Kynar 500 coating. Two coat coil-applied, baked-on full-strength (70% resin, PVF2) fluorocarbon coating consisting of a nominal of .25 mil dry film thickness primer, nominal dry film thickness of .75 mil color coat.
02 Finish to be selected from manufacturer's standard color selection.
03 The back side of the material should be .25 mil primer and 0.25 polyester wash coat. Color shall be selected by the Architect.

J. Fasteners and Accessories:
01 Concealed supports, angles, plates, accessories and brackets: in gauge and finish as recommended, and furnished by manufacturer.

02 Accessory Screw: Size and screw type as provided by panel manufacturer for each use, with prefinished hex washer head in color to match panels where exposed to view.

03 Rivets: full stainless steel, including mandrel, in size to match application.

04 Field Sealant: Color coordinated primerless silicone, or high grade, non-drying butyl, as supplied by panel manufacturer.

05 Sealant Tape: non-drying, 100 percent solids, high grade butyl tape, as supplied by panel manufacturer, in sizes to match application.

06 Pipe Penetration Flashings: flexible boot type, with stainless steel compression ring, and stainless-steel pipe strap, Dektite by Buildex, or approved substitute. Use silicone type at hot pipes.

07 Metal Roof Curbs: welded aluminum, or stainless steel, factory-insulated, with integral cricket, and designed to fit roof panel module, sized to meet application, by L.M. Curbs, or approved substitute.

2.2 RIGID INSULATION DECKING

A. The design of metal roof panels is based on products manufactured by Atlas Roofing Corporation.

B. Other acceptable manufacturers: The following manufacturers are acceptable to provide metal roofing panels, provided the proposed products meet or exceed all specified requirements.

01 Carlisle
02 Dow
03 GAF
04 IKO
05 Johns Manville
06 Rmax Operating
07 Soprema

C. Rigid Roof Insulation Board and Decking Board:

01 Provide and install roof insulation on the structural metal decking as required to achieve a smooth uniform roof with no bumps, crimps or unevenness. Must be compatible with the underlayment to be installed on it.

02 Install ASTM C-1289, Type II, Grade 3, Rigid Polyisocyanurate Roof Insulation; 2 layers of 2” thickness each for a total of 4" thickness. Stagger board joints.

a. RMax, Inc..
b. Atlas Roofing Corporation, Atlanta, GA.

03 Minimum R Value: 20 (R 10 each sheet).

a. Complies: ASTM C 578, Type IV.
b. Approvals: For installation in FM 4470 and I-90 Windstorm Classification.
c. Manufacturer: Dow Chemical.

D. Nailable Sheathing Deck:

01 Provide and install nailable plywood sheathing above rigid insulation board.

02 Nailable Plywood Sheathing: type CDX plywood, minimum 19/32” thickness.

03 Provide in 4’ x 8’ sheets.

04 Provide screw fasteners of sufficient length to penetrate metal deck substrate a minimum of 1”.

2.3 ROOFING UNDERLAYMENT

A. The design of roofing underlayment is based on products manufactured by W.R. Grace & Co.

B. Other acceptable manufacturers: The following manufacturers are acceptable to provide metal roofing panels, provided the proposed products meet or exceed all specified requirements.
   01 Atlas International
   02 Carlisle
   03 GAF
   04 Henry Company
   05 Soprema

C. Design of underlayment is based on Grace Ice & Water Shield HT.

D. General:
   01 Self-adhering roofing underlayment comprised of an aggressive rubberized asphalt adhesive backed by a layer of slip resistant coated high density cross laminated polyethylene film.
   02 Backed with release paper.
   03 Membrane Thickness: Minimum 40 mils – ASTM D3767 method A.
   04 Membrane Tensile Strength: 250 PSI – ASTM D412.
   05 Membrane Elongation: 250% - ASTM D412.
   06 Membrane Permeance: 0.05 Perms – ASTM E96.
   07 Membrane Roll Width: 36”. Use maximum roll width wherever possible to eliminate joints.

PART 3 - EXECUTION

3.1 PREPARATION PRODUCT HANDLING, STORAGE AND DELIVERY

A. Immediately upon delivery to job site, place materials in area protected from weather. Materials shall be sorted and handled to prevent inclusion of foreign materials and damage by water or weather.
   01 Exercise care in unloading, storing and erecting panels to prevent bending, warping, twisting and surface damage.
   02 Storage: Store in original packages that are designed to protect against transportation damage, until ready for use. Store all material and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up between each panel.
   03 Remove from site panels which are damaged, or become water-stained during storage and handling. Remove, and replace materials, which are installed damaged, or stained.
   04 Do not permit unnecessary walking on finished roof. All personnel installing finished roof shall be required to wear rubber sole shoes.

B. Ensure surfaces are ready for panel application.

C. Inspect and ensure surfaces are free from objectionable warp, wave, and buckle before proceeding with installation of pre-formed metal roofing.

D. Ensure substrate is ready to receive metal roofing. Report items for correction and do not proceed with metal roof panel system installation until resolved.

3.2 INSTALLATION OF RIGID INSULATION AND PLYWOOD DECK

A. Rigid Insulation:
   01 Install rigid insulation directly on metal decking.
   02 Insulation shall be installed in full size sheets wherever possible.
   03 When rigid insulation deck is made up of multiple layers, stagger joints at half-points in both directions.
   04 Install panels with tight joints.

B. Plywood Decking:
   01 Install rigid insulation directly on metal decking.
   02 Insulation shall be installed in full size sheets wherever possible.
   03 When rigid insulation deck is made up of multiple layers, stagger joints at half-points in both directions.
   04 Install panels with tight joints.

3.3 INSTALLATION OF UNDERLAYMENT

A. Install underlayment directly on a clean, dry solid substrate of plywood sheathing.

B. Install in maximum widths and lengths to minimize joints.

C. Work from low to high so that all laps shed water.

D. Side Laps: Minimum 3.5”. End Laps: Minimum 4”.

3.4 INSTALLATION OF STANDING SEAM ROOFING

A. Comply with and install roofing and flashings in accordance with all details shown on manufacturer’s approved Shop Drawings and manufacturer's product data and instructions, within specified erection tolerances.

B. Install field panels in continuous lengths, without endlaps. Remove and replace panels with endlaps.

C. Do not install panels damaged by shipment or handling.

D. Install intermittent clips with bearing plates and continuous clips according to pattern in wind uplift rating at field, corners and perimeter roof areas.

E. Fix panels at location depicted on reviewed Shop Drawing(s).

F. Breadpan roof panel at ridge, hip and headwalls.

G. Allow for 1-inch panel clearance at penetrations.

H. Install concealed supports, angles and brackets as furnished by manufacturer to form complete assemblies.

I. Remove roof panel and flashing protective film prior to extended exposure to sunlight, heat, and other weather elements.

J. Field-apply sealant tape and gun-grade sealant according to reviewed Shop Drawings and manufacturer’s requirements for airtight, waterproof installation.

K. Ensure sealant beads and tape are applied prior to sheet metal installation to achieve a concealed bead. Neatly trim exposed portions of sealant without damaging roof panel or flashing finish.

L. Align pipe penetrations to occur at center of roof panel. Report and have corrected improperly-placed penetrations before proceeding with panel installation. Remove and replace roof panels which have improperly-placed penetration flashings.

M. Align roof curbs to fit roof panel module and overlap standing seam(s). Allow for proper drainage on both sides of curb.

N. Install sheet metal flashings according to manufacturer's recommendations, reviewed Shop Drawings and in accordance with provision of Section 07 62 00 – Sheet Metal Flashing.

3.5 WORKMANSHIP

A. Install panel systems straight and true, free from defects. Isolate dissimilar metal contact with proper taping and/or coatings. Install flashing and corners to provide a watertight system.

3.6 CLEANING

A. Clean exposed surfaces of Work promptly after completion of installation.

B. Clean mud, dirt, and construction-related debris from panels before panels are scratched or marred.

3.7 PROTECTION

A. Protect Work as required to ensure roofing will be without damage at time of final completion.

B. Do not allow excessive foot traffic over finished surfaces.

C. Do not track mud, dirt, or construction-related debris onto panel surfaces.

D. Replace damaged Work before final completion.

3.8 INSPECTION

A. Architect and Contractor reserve the right to inspect the Work during application.

B. Upon completion of the Work, if inspection discloses that roofing is not according to Specifications or has been damaged, Contractor agrees to furnish additional materials necessary to make repairs and place work in an acceptable condition.

END OF SECTION

SECTION 07 54 19

THERMOPLASTIC SINGLE PLY MEMBRANE ROOFING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all labor and materials required to furnish and install a fully-adhered TPO single-ply membrane roofing system, complete with membrane roofing, insulation, fasteners, sheet metal flashing, accessories and all related items necessary for a complete and watertight roofing system.

C. Related Work:
   01 Section 03 52 16.19 – Lightweight Insulating Concrete
   02 Section 05 12 00 – Structural Steel Framing
   03 Section 05 21 00 – Steel Joists Framing
   04 Section 06 10 00 – Rough Carpentry
   05 Section 07 62 13 – Sheet Metal Flashing
   06 Section 07 72 00 – Roof Accessories
   07 Section 07 72 23 – Roof Hatches and Vents

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. To Architect/Owner:
   01 Product Data: Within eight weeks of award of contract, submit:
      a. Submit minimum of two samples of sheet material and descriptive literature.
      b. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
      c. Provide all other data and information to satisfy requirements of manufacturer on warranty needs.
      d. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to furnish and install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
      e. Samples of proposed warranty complete with any addenda necessary to meet the warranty requirements as specified.
      f. The roofing manufacturer for all systems listed must present written evidence that the roofing system is a Class "A" fire rated system. All roof components must be certified complaint.
      g. All roofing systems shall conform to applicable building code requirements, including ASCE-7 wind loading requirements.

C. To Roofing Manufacturer:
   01 Shop drawings must be submitted to roofing manufacturer for approval.
   02 Approved shop drawings are required for inspection of the roof.
      a. Shop drawings shall be approved and assigned a number by the roofing manufacturer.
      b. Shop drawings shall include:
         01 Outline of roof and size.
         02 Location and type of all penetrations.
         03 Perimeter and penetration details.
         04 Sheet layout and sizes.
         05 Number of flashing rolls by width.
         06 Insulation manufacturer, brand and thickness.
         07 Fastener length.
         08 Warranty type and period.
         09 Completely executed Notice of Award.
         10 Deck types.
         11 Roof slope and designated direction of slope.
   03 When field conditions necessitate modifications to the originally approved shop drawings, a copy of the shop drawing outlining all modifications shall be submitted for approval.

D. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

E. Operations and Maintenance Manuals:
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to Section 01 78 23 – Operations and Maintenance Manuals.
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   01 ASTM C920 – Specification for Elastomeric Joint Sealants.
   02 ASTM D751 – Specification for Testing Coated Fabrics.
   03 ASTM D1149 – Test for Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimens).
   04 ASTM D1204 – Test for Linear Dimensional Changes of Non-Rigid Thermoplastic Sheeting or Film at Elevated Temperature.
   05 ASTM D1621 – Test for Compressive Properties of Rigid Cellular Plastics.
   06 ASTM D2136 – Specification for Testing Coated Fabrics, Low-Temperature Bend Test.
   07 ASTM E96 – Tests for Water Vapor Transmission of Materials.
   08 ASTM E108 – Specification for Fire Tests of Roof Coverings.
   09 ASTM E838 – Practice for Performing Accelerated Outdoor Weathering Using Concentrated Natural Sunlight.
   10 ASTM G21 – Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. Federal Specifications:
   01 101B.
   02 191.
   03 TT-S-00230C.
   04 HHI 1972.

C. Factory Mutual:
   01 FM1-90.

D. Underwriter's Laboratories, Inc.:
   01 Class A Materials.

E. American Society of Civil Engineers (ASCE):
   01 ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures

F. National Roofing Contractor Association (NRCA)

G. ANSI/SPRI:
   01 ES-1 Test Standard for Edge Systems Used with Low Slope Roofing Systems.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A manufacturer's top-tier qualified firm that has been continuously approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product for minimum of five (5) years prior to bid date, and that is eligible to receive manufacturers' special warranty; with minimum five (5) years documented experience, including:
   01 Certified by roofing materials manufacturer as an approved NDL applicator for minimum of two (2) years prior to bid date, and qualified to provide specified warranty on selected systems and flashing.
   02 Minimum three (3) projects of comparable size and specified systems during that time.

B. There shall be no deviation made from this specification or the approved shop drawings without prior written approval by the manufacturer and Architect.

C. The membrane must be manufactured by the material supplier. Manufacturer's supplying membrane made by others are not acceptable.

D. The TPO White membrane meets CRRC (Cool Roof Rating Council) for reflectance and emittance. When tested in accordance with ASTM C1549, the roofing material has a minimum initial solar reflectance of 0.75.

E. Schedule a pre-installation conference. Refer to Section 01 31 29 - Notification of Architect Requirements.

F. Site Conditions (Environmental Requirements):
   01 Apply roofing in dry weather.
   02 Do not apply roofing when ambient temperature is below 40°F.

G. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a non-sales technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued.

H. Notify the building owner seventy-two (72) hours prior to the manufacturer's final inspection.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.

B. Comply with the manufacturer's written instructions for proper material storage.

C. Any materials which are found to be damaged shall be removed and replaced at the applicator's expense.

1.6 WARRANTY

A. Provide manufacturer’s twenty (20) year Total System Warranty covering both labor and material with no dollar limitation from date of Substantial Completion for this project. Guarantee responsibilities shall be as follows:

01 Roofing contractor shall guarantee the roof application with respect to workmanship and proper application for a period of two (2) years from date of Substantial Completion.

02 Materials manufacturer shall continue the guarantee for an additional eighteen (18) years.

03 The roof system including flashings shall be guaranteed against failure of workmanship and materials. Repair of the system, including materials and labor, shall be performed at no cost to the Owner.

04 The warranty shall provide for completion of repairs or total replacement of the “roofing system” at the then current material and labor prices throughout the life of the warranty.

05 Warranty shall contain no exclusions for ponded water, biological growth or consequential damages.

06 Roof manufacturer is to review the installation upon completion and the warranty issue.

07 Warranty is to be a separate dollar amount in the schedule of values and payable up on the roof warranty information being accepted by the District.

08 Standard 72 mph warranty.

B. Pro-rated System Warranties shall not be accepted.

C. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's review.

1.7 JOB CONDITIONS, CAUTIONS AND WARNINGS

A. Refer to Manufacturers Adhered Roofing System specification for General Job Site Considerations.

B. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

C. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

F. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

G. New roofing shall be complete and weather tight at the end of the work day. Care must be taken to avoid wicking water though the fleece by properly sealing exposed edges of the membrane.

H. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

I. The roofing contractor shall use reasonable care and responsibility to protect the building and site against damages. The contractor shall be responsible for the correction of any damage.

J. The roofing contractor shall remove all debris from the job site in a timely and legally acceptable manner so as to not detract from the aesthetics or the functions of the building.

1.8 JOB SITE PROTECTION

A. The roofing contractor shall adequately protect building, paved areas, service drives, etc. from damage while performing the required work and remove protection material at completion. The contractor shall repair or be responsible for costs to repair all property damaged during the roofing application.

B. Do not overload any portion of the building, by either use of or placement of equipment, storage of debris, or storage of materials.

C. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.

D. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains, if required. At completion, test drains to ensure the system is free running and drains are watertight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.

E. Store moisture susceptible materials above ground and protect with waterproof coverings.

F. Remove all traces of piled bulk material and return the job site to its original condition upon completion of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Roofing: The design of thermoplastic single ply roofing membrane system is based on products manufactured by Elevate.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products / roofing system provided the proposed products / roofing systems meet or exceed all specified requirements.
   01 Carlisle Syntech
   02 Johns Manville

C. Insulation:
   01 As approved by roofing manufacturer.
   02 Refer to section 03 52 16.19 – Lightweight Insulating Concrete.

2.2 MATERIALS

A. General: Membrane components to be products of the membrane manufacturer. All products (including adhesives, insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the warranty. No substitutions shall be accepted.

B. Membrane:
   01 Furnish Ultraply TPO XR FleeceBACK fully-adhered, 115 membrane, which shall incorporate a minimum 60-mil thick Thermoplastic Polyolefin (TPO) membrane laminated to a 55-mil woven fleece backing resulting in a total sheet thickness of 115 mils minimum .
   02 Membrane Color: White top surface with SRI (solar reflectance index) not less than 75% initial reflectivity.
      a. White TPO Membrane Sheets shall be sized to minimize the number of joints on the roof.
   03 TPO mill Bareback membrane as flashings.

C. Adhesives, Cleaners and Sealants:
   01 Membrane and Insulation Adhesives:
      a. Lowrise Foam Adhesive: A two component insulating urethane adhesive used to attach insulation and FleeceBACK membrane. Packaging formats include 50 and 15 gallon drums as well as Dual Cartridges and 5 gallon Bag in a Box formats.
   02 Bonding Adhesive: A high-strength, synthetic rubber adhesive used for bonding membrane to various surfaces. The adhesive is applied to both the membrane and the substrate per manufacturers requirements.
   03 Cut-Edge Sealant: A white or clear colored sealant used to seal cut edges of reinforced membrane.
   04 Water Cut-Off Mastic: Used as a mastic to prevent moisture migration at drains, compression terminations and beneath conventional metal edging (at a coverage rate of one (1) tube per drain).
   05 All Purpose Sealant: A 100% solids, solvent free, VOC free, one part polyether sealant that provides a weather tight seal to a variety of building materials. It is white in color and is used for general caulking such as above termination bars and metal counter flashings and at scuppers.
   06 Thermoplastic One-Part Pourable Sealer: A one-part, moisture curing, elastomeric polyether sealant used to fill TPO Molded Pourable Sealant Pockets. Packaged in 4, 2-liter foil pouches inside a reusable plastic bucket. 1 pouch will fill 2 TPO Molded Pourable Sealant Pockets.
   07 Membrane Cleaner: Used to prepare membrane for heat welding that has been exposed to the elements or to remove general construction dirt.
   08 TPO Primer: A solvent-based primer used to prepare the surface of Membrane prior to application of Pressure-Sensitive Coverstrip and TPO Pressure-Sensitive RUSS.

09 TPO Low VOC Primer: A solvent-based, low solids primer used to prepare the surface of Membrane prior to application of Pressure-Sensitive Coverstrip and TPO Pressure-Sensitive RUSS. This low VOC product is ideal for use in states where environmental issues are a concern.

D. Fasteners and Plates:
01 Term Bar Nail-Ins: A 1-1/4" long expansion anchor with a zinc plated steel drive pin used for fastening the Carlisle Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.

E. Walk pads:
01 Protective surfacing for roof traffic shall be TPO Walkway Pads installed per manufacturer's requirements.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify decking and structural components are ready to receive work.

B. Proceed with installation only after the unsatisfactory conditions have been corrected.

3.2 GENERAL REQUIREMENTS

A. Comply with the manufacturer's published instructions and NRCA standards for the installation of the membrane roofing system including proper substrate preparation, job site considerations and weather restrictions.

B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

C. Precautions:
01 Provide temporary cutoff in order to maintain watertight conditions as necessary when areas cannot be completed in one day.
02 In making all field heat welds, make sure all edges are cleaned and free of tar, mastic or other foreign material.
03 Do not expose membrane and accessories to a constant temperature in excess of 180 degrees Fahrenheit, unless stated otherwise by roofing membrane manufacturer.
04 Sealants and adhesives should be applied according to manufacturer's specifications and all containers shall be disposed of properly.
05 Start securing the membrane at the highest point and work toward the drains.

D. Protection of Roofing Surfaces: Storing, wheeling, or trucking directly on roof insulation or membrane surface is not recommended.

3.3 MEMBRANE PLACEMENT, BONDING, AND HOT AIR WELDING PROCEDURES

A. Follow manufacturer's written installation procedures.

3.4 FLASHING

A. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.5 WALKWAYS/WALK PADS/ WALK MAT

A. Provide walk pads at all high traffic areas, such as, but not limited to, roof hatches or access doors, roof top equipment access panels, and roof top ladders, and at all locations as identified on the drawings.

B. Provide walk pads under all pipe supports and splash pans/splash blocks.
   01 Walk mat material shall extend 1 foot minimum all-around splash block except up against wall.

C. Install per manufacturer's written instructions.

3.6 DAILY SEAL

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the workday, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

3.7 ADJUSTING AND CLEANING

A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

C. Adjustments: After an authorized Quality Assurance Technician has inspected the roof for determining acceptability for warranty issuance, any deficiencies on the final inspection report shall be corrected by the contractor/applicator and made ready for re-inspection within five (5) working days.

D. Protection of Roofing Surfaces: Storing, wheeling, or trucking directly on roof insulation or membrane surface is not recommended. Smooth, clean plywood or plank walkways, runways and platforms shall be provided as necessary.

END OF SECTION

SECTION 07 62 13

PRE-ENGINEERED METAL ROOF EDGE AND COPINGS

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Refer to Document 00 21 13, Instructions to Bidders and 00 22 13 Supplementary 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 SECTION INCLUDES

A. It is the intent of this Section that the Work shall:
   1. conform to all applicable building code requirements and of authorities having jurisdiction;
   2. include all shop and field formed sheet metal work shown on drawings, specified, or required, including, but not limited to:
      a. Roof penetration sleeves and hood and umbrella counterflashing
      b. Scuppers
      c. Metal perimeter edge
      d. Copings, trim, and miscellaneous sheet metal accessories.
   3. be part of the Work of the Roofing System; and
   4. be performed by a single source contractor.

1.3 RELATED WORK

A. Section 07 54 20 – Fully Adhered TPO Membrane Roofing System

B. Section 07 72 00 – Roof Accessories

C. All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing, and electrical items.

1.4 REFERENCES

A. ASTM International (ASTM)
   1. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
   2. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
   3. B32, Standard Specification for Solder Metal
   4. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

B. ASCE 7

C. Federal Specifications (FS)
   1. QQ-L-201 for lead

D. National Association of Architectural Metal Manufacturers (NAAMM)

E. National Roofing Contractors Association (NRCA)
   1. Roofing and Waterproofing Manual

F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
   1. Architectural Sheet Metal Manual

G. ANSI / SPRI ES-1

1.5 SUBMITTALS

A. Product Data:
   1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   2. Manufacturer's installation instructions.

B. Shop Drawings: Indicating sizes, configurations, details of attachment to related and adjacent work, materials, and finishes.

C. Samples:
   1. Full range of finish colors for Architect's selection.
   2. 12-inch-long sample of each specified item with approved finish.
   3. Provide full size mockup of all shop-built assemblies.
   4. Documentation of Wind uplift requirements for Roof Edge for specific project location
      a. Wind Calculator available online

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Fabricator and installer of roof-related flashing, installer of prefabricated edge metal and accessories shall be the same as the membrane roof installer.

B. Comply with governing codes and regulations of authorities having jurisdiction.

C. ANSI / SPRI ES-1: Install sheet metal edge flashings and copings to comply with requirements of ANSI / SPRI ES-1 / FM 1-49 for minimum of up to 150 MPH wind speed zone and wind resistance loads.

1.7 INSTALLATION CONFERENCE

A. Refer to Section 01 31 13, Project Coordination.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, handle and store materials in accordance with manufacturer's instructions.

B. Handle and store materials and equipment in such a manner as to avoid damage.

C. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form. Do not place materials or equipment in such a manner as to overload structure.

1.9 WARRANTIES

A. Manufacturer's Product Warranty:
   1. Manufacturer's standard 30-year Kynar 500 or Hylar 5000 Finish warranty signed by the manufacturer, with guarantee covering any failure of the fluoropolymer finish during the warranty period.
   2. Failure is defined to include, but not be limited to:
      a. Deterioration of finish, such as fading, discoloring, peeling, cracking, corroding, etc.
   3. Wind Warranty
      a. See individual products below.
   4. Correction may include repair or replacement of failed product as outlined in Warranty Documents
   5. Finish warranty and wind warranty shall be delivered by Roofing Contractor to Owner at the conclusion of project as part of project closeout documents.

B. Roofing Contractor's Warranty:
   1. The contractor shall warrant the installation and related work to be free from defects in workmanship and materials, and that the metal flashings will be and remain watertight and secure, for a period of five (5) years from the date of Substantial Completion.
   2. Defects shall include, but not be limited to:
      a. Leaking water on the exterior of the building, causing staining or discoloration of wall / exterior surface.
      b. Leaking water or bitumen within building or construction.
      c. Becoming loose from substrate / blocking.
      d. Loose or missing parts.
      e. Finish failure as defined above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Metal Era, Inc., which is located at: 1600 Airport Rd.; Waukesha, WI 53188; Toll Free Tel: 800-558-2162; Tel: 262-549-6900; Fax: 800-373-9156; Email: request info (info@metalera.com); Web:www.metalera.com

B. Substitutions: Before proposal date upon roof consultant approval.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 25 13.

D. Manufacturers named within specification are approved for use on the Project providing:
   1. their products meet or exceed the specifications;
   2. company has a minimum of five (5) years' experience manufacturing products of the type specified;
   3. products have been tested in conjunction with roofing membrane system as an assembly and as such has obtained the same approval and rating as the roofing membrane system; and
   4. products are approved for use by the roofing membrane manufacturer.

2.2 SHEET METAL MATERIALS

A. General Requirements: Roofing sheet metal system shall have been tested in conjunction with roofing membrane system as an assembly and have the same approval and rating as the roofing membrane system.

B. Prefinished Galvanized Sheet Steel:
   1. Commercial quality ASTM A527 G-90 hot-dip galvanized coating designation.
   2. Thickness: Except as otherwise indicated, minimum 24 gauge. SMACNA recommendations shall govern.
   3. Finish: Kynar 500 or Hylar 5000 in color as selected by Architect from manufacturer's full range of colors.

2.3 FASTENERS

A. Same metal as flashing / sheet metal or other non-corrosive metal or as noted below.

B. Exposed fasteners shall be self-sealing and gasketed (ZAC type) for weathertight installation.

C. Match finish of exposed heads with material being fastened.

D. Mechanical Fasteners:
   1. Nails: Ring shank, minimum 1-1/2 inches in length with 1/2-inch diameter head.
   2. Washers: Steel washers with bonded rubber sealing gasket.
   3. Screws: Self-tapping sheet metal type of stainless steel or compatible with material being fastened, with hooded integral EPDM washers (ZAC type).
   4. Rivets: Stainless steel and cadmium plated material, closed end type of sizes recommended by sheet metal manufacturer to suit application.

E. Clips:
   1. Cleat (coping / fascia): Minimum 22, G-90 galvanize. Match material of coping / fascia and provide one (1) gauge heavier.

2.4 RELATED MATERIALS

A. Solder: ASTM B32, alloy grade 58, 50 percent tin, 50 percent lead.

B. Flux:
   1. Phosphoric acid type, manufacturer’s standard.
      a. For Use with Steel or Copper: Rosin flux
      b. For Use with Stainless Steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.

C. Underlayment:
   1. At wood blockings: Self-Adhered Flexible Flashing: 40-mil, rubberized asphalt adhesive reinforced flashing with a high density cross laminated polyethylene film. Provide compatible substrate primer as instructed by manufacturer and coordinate with specification 07 65 00.

D. Adhesives: Type recommended by flashing sheet manufacturer seaming and adhesive application of flashing sheet to ensure adhesion and watertightness.

E. Metal Accessories: Sheet metal clips, straps, anchoring devices, clamps, and similar accessories required for the complete installation of work, matching or compatible with material being installed, non-corrosive, size and gauge recommended by installer to suit application and performance.

F. Sealant:
1. Type A:
   a. Type: One-part, non-sag, moisture-curing polyurethane sealant.
   b. Approved Products / Manufacturers: “Chem-Calk 900” manufactured by Bostik Construction Products Division, “Vulkem 921” manufactured by Mameco International, Inc., “Dynatrol I” manufactured by Pecora Corporation, “MasterSeal NP 1” manufactured by BASF, or approved equal.
2. Type B:
   a. Type: One-part, neutral-curing, medium-modulus silicone sealant for sealing metal to metal surfaces, i.e., metal edge, cover plates, etc.
   b. Approved Products / Manufacturers: “Chem-Calk 1200” manufactured by Bostik Construction Products Division, ”795 Silicone Building Sealant” manufactured by Dow Corning Corporation, “895 Silicone” manufactured by Pecora Corporation, “Omniseal” manufactured by Sonneborn Building Products, “Spectrem 2” manufactured by Tremco Incorporated, or approved equal.

2.5 FABRICATION

A. Except as otherwise indicated, fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed shop drawings. Form all flashings, receivers, and counterflashing in accordance with standards set forth in the NRCA roofing manual and SMACNA.

B. Comply with manufacturer's installation instructions and recommendations.

C. Shop fabricate Thru-wall, counterflashing’s, expansion joint metal and wind clips to the greatest extent possible.

D. Fabricate items to size and dimensions as indicated on the drawings. Limit single-piece lengths to twelve (12) feet for prefabricated pieces and ten (10) feet for shop fabricated pieces.

E. Face of any fabricated vertical metal fascia or coping shall not exceed 8” without stiffener band or bird’s beak. If stiffener band or bird’s beak cannot be fabricated, contractor to use multiple pieces of metal to achieve overall distance without going over the 8” maximum per piece.

F. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work sufficient to permanently prevent leakage, damage, or deterioration of the work.

G. Integrate flashing in a manner consistent with membrane waterproofing detailing. Form work to fit substrates.

H. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.

I. Fabricated items will have straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.

J. Fold back edges on concealed side of exposed edge to form hem.

K. Unless noted otherwise, lap joints minimum three (3) inch. Lap joints to have sealant installed as per details, to maintain watertight condition, inside and outside corners and elevation changes to be riveted and soldered.

L. Seams:
1. Wherever possible, fabricate non-moving seams in sheet metal with flat-lock seams and end joints.
2. Pre-finished Galvanized Steel: Seal pre-finished metal seams with rivets and silicone sealant.
3. Metal Other than Aluminum: Tin edges to be seamed, form seams, and solder.

M. On Kynar 500 or Hylar 5000 pre-finished metal, surface sand metal flanges prior to applying any primers. Prime all metal in contact with bituminous material.

N. Backpaint all concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.

O. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than one (1) inch deep filled with mastic sealant concealed within joints.

2.6 FABRICATED ITEMS

A. Metal Edge / Fascia:

1. Edge Systems One “One Gravel Stop” for TPO roof Systems: Features a continuous cleat with pre-slotted fastening holes in the roof flange.
   1) Metal:
      a) 24-gauge galvanized steel.
   2) Finish:
      a) Kynar-500 color as selected by the Architect from roof edge manufacturer's full range of colors.
   3) Fascia: Standard 12 feet 0 inches lengths with matching concealed joint splice plates.
   4) Splice Plates and 22 gauge galvanized continuous cleats with slotted holes are included.
   5) Performance:
      a) 20 Year, 160 mph Wind Warranty
      b) Tested per ANSI/SPRI ES-1/FM4435 Standard to a design pressure of 276 lbs./ft^2 to comply with the International Building Code.
      c) Factory Mutual approved I-285 for wind up lift protection.

B. Metal Coping
1. Perma-Tite Gold Coping
   1) Construction:
      a) Metal:
         1) 24-gauge galvanized steel.
      b) Finish:
         1) Kynar-500 color as selected by the Architect from roof edge manufacturer's full range of colors.

2) Coping Cap: Length of 12'-0", widths to 24" manufactured to job requirements. True radii may be built to template.
3) Coping Vertical Face and Back Leg: 2 ¼" to 12 ½" manufactured to job requirements.
4) Concealed Splice Plates: 8" wide. Finish to match finish of coping cap with factory applied dual non-curing sealant strips.
5) Anchor / Support Cleat: 20-gauge pre-punched galvanized cleat with stainless steel spring mechanically locked to cleat normally 12" wide at 4'-0" on center. Mechanically fastened as indicated and detailed.
6) Fasteners: 1 ½" stainless steel with driver.
7) Performance:
   a) Lifetime, 215 mph Wind Warranty
   b) Tested per ANSI / SPRI ES-1 / FM4435 Standard to comply with the International Building Code.
   c) Miami-Dade Approved (No. 13-0419.03 12/11/18) to comply with the "High Velocity Hurricane Zone of the Florida Building Code".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrates are smooth and clean to the extent required to perform sheet metal work.

B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set in place.

C. Verify that reglets, nailers, cants, and blocking to receive sheet metal are in place and free of concrete and soil.

D. Do not start work until conditions are satisfactory.

3.2 PREPARATION

A. Field measure site conditions prior to fabrication work.

B. Install starter and edge strips and cleats before starting installation.

3.3 INSTALLATION

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4-inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Prefabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than three (3) feet from actual corner. Laps shall be one (1) inch, riveted and soldered at following locations:
   1. Prefabricated corners;
   2. transitions;
   3. changes in direction, elevation, and plane; and
   4. at intersections.

B. Anchor units work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners wherever possible; and set units true to line and level as indicated. Install work with laps, joints, and seams which are permanently watertight and weatherproof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.
   1. Ensure approved fasteners are used throughout the project.
   2. Ensure fasteners are installed in manufacturer pre-punched holes on rails, extrusions, clips, and cleats.
   3. Ensure sufficient amount of waterblock is applied where appropriate to prevent leaking under rails/extrusions. **The contractor is responsible for cleaning-stained brick and remedying for total length of workmanship warranty if waterblock is not installed appropriately.**

D. Separations: Provide for separation of metal from dissimilar metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials which are incompatible with roofing system.

E. Cleat: At exposed edges of perimeter edge, fascia's, cap flashings, and where required, attach cleat with appropriate fasteners supplied by roof edge manufacturer. Install cleat so fascia extends a minimum of 1 inch below top of exterior wall finish.

3.4 CLEANING AND PROTECTION

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean of stains.

B. Remove scraps and debris and leave the work area clean.

C. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. Paint areas where finish is damaged on pre-finished metal by painting with a compatible paint in color to match undamaged finish.

D. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

E. Paint metal flashings that have been soiled with bitumen with aluminized paint.

F. Clean other work damaged or soiled by the Work of this Section.

G. Protect finished work from damage.

END OF SECTION

SECTION 07 63 00

ROOF RELATED SHEET METAL

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. It is the intent of this Section that the Work shall:
   1. conform to all applicable building code requirements and of authorities having jurisdiction;
   2. include all shop and field formed sheet metal work shown on drawings, specified or required, including, but not limited to:
      a. Roof penetration sleeves and hood and umbrella counterflashing
      b. Metal counterflashing
      c. Expansion joint
      d. Roof drains
      e. Scuppers
      f. Metal perimeter edge
      g. Gutters, Downspouts, Splash Blocks and Splash Pans
      h. One-way roof moisture relief vents
      i. Metal gravity vents
      j. Metal heat exhaust vents
      k. Sanitary vent pipes
      l. Pipe box
      m. Copings, trim and miscellaneous sheet metal accessories.
   3. be part of the Work of Section 07 54 19, Single Ply Membrane; and
   4. be performed by a roof membrane contractor.

1.3 RELATED WORK

A. Section 07 54 20 – Fully Adhered Thermoplastic Single Ply Membrane Roofing System

B. Section 07 72 00 - Roof Accessories

C. All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing and electrical items.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. A525, Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
   2. A526, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
   3. A527, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
   4. A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
   5. B32, Specification for Solder Metal

6. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

B. ASCE 7

C. Federal Specifications (FS)
1. QQ-L-201

D. National Association of Architectural Metal Manufacturers (NAAMM)

E. National Roofing Contractors Association (NRCA)
1. Roofing and Waterproofing Manual

F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
1. Architectural Sheet Metal Manual

G. ANSI / SPRI ES-1: Fabricate and install sheet metal edge flashings and copings to comply with requirements of ANSI / SPRI ES-1 for 150 MPH wind speed zone and wind resistance loads.

1.5 SUBMITTALS

A. Product Data:
1. Manufacturer’s specifications and other data needed to prove compliance with specified requirements.
2. Manufacturer’s installation instructions.

B. Shop Drawings: Indicating sizes, configurations, details of attachment to related and adjacent work, materials, and finishes.

C. Samples:
1. Full range of finish colors for Architect's selection.
2. 12-inch-long sample of each specified item with approved finish.
3. Provide full size mockup of all shop-built assemblies.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Fabricator and installer of roof-related flashing and accessories shall be the same as the membrane roof installer.

B. Comply with governing codes and regulations of authorities having jurisdiction.

C. ANSI / SPRI ES-1: Fabricate and install sheet metal edge flashings and copings to comply with requirements of ANSI/SPRI ES-1 for 120 MPH wind speed zone and wind resistance loads.

1.7 INSTALLATION CONFERENCE

A. Refer to Section 01 31 13, Project Coordination.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, handle and store materials in accordance with manufacturer's instructions.

B. Handle and store materials and equipment in such a manner as to avoid damage.

C. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form. Do not place materials or equipment in such a manner as to overload structure.

1.9 WARRANTIES

A. Manufacturer's Product Warranty:
   1. Manufacturer's standard 20-year Kynar 500 or Hylar 5000 Finish warranty signed by the manufacturer, guaranteeing covering failure of the fluoropolymer finish during the warranty period.
   2. Failure is defined to include, but not be limited to:
      a. Deterioration of finish, such as fading, discoloring, peeling, cracking, corroding, etc.
      b. Leaking water within building or construction.
   3. Correction may include repair or replacement of failed product.

B. Roofing Contractor's Warranty:
   1. Contractor shall warrant the sheet metal work and related work to be free from defects in workmanship and materials, and that the metal flashings will be and remain watertight, for a period of five (5) years from date of Substantial Completion.
   2. Defects shall include, but not be limited to:
      a. Leaking water or bitumen within building or construction.
      b. Becoming loose from substrate.
      c. Loose or missing parts.
      d. Finish failure as defined above.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Manufacturers named within specification are approved for use on the Project providing:
   1. their products meet or exceed the specifications;
   2. company has a minimum of five (5) years experience manufacturing products of the type specified;
   3. products have been tested in conjunction with roofing membrane system as an assembly and as such has obtained the same approval and rating as the roofing membrane system; and
   4. products are approved for use by the roofing membrane manufacturer.

B. Substitutions shall be in accordance with Division 1 requirements regarding substitutions.

2.2 SHEET METAL MATERIALS

A. General Requirements: Roofing sheet metal system shall have been tested in conjunction with roofing membrane system as an assembly and have the same approval and rating as the roofing membrane system.

B. Prefinished Aluminum Sheet (gutters and downspouts):
   1. Precoated type, aluminum conforming to Fed. Spec. QQ-A-250, ASTM B209.
   2. Finish: Kynar 500, color as selected by Architect from manufacturer's standard colors.
   3. Thickness: Minimum 0.040 inch, except as otherwise indicated.

C. Membrane Clad Galvalume Sheet Steel:
   1. Commercial quality with 0.20 percent copper, conforming to ASTM A526, except ASTM A527 for lock forming, with G-90 hot-dip galvanized coating designation.
   2. Thickness: Except as otherwise indicated, minimum 24 gauge. SMACNA recommendations shall govern.
   3. Finish: membrane coating as per Membrane Manufacturer's requirements.

E. Stainless Steel: ASTM A167, Type 302/304 Soft Temper, No. 2D finish. Minimum thickness 24 gauge, except as otherwise noted.

2.3 FASTENERS

A. Same metal as flashing/sheet metal or other non-corrosive metal or as noted below.

B. Exposed fasteners shall be self-sealing and gasketed for weathertight installation. (ZAC type)

C. Match finish of exposed heads with material being fastened.

D. Mechanical Fasteners:
   1. Nails: Stainless Steel Ring shank, minimum 1-1/2 inches in length with 1/2-inch diameter head.
   2. Washers: Steel washers with bonded rubber sealing gasket.
   3. Screws: Self-tapping sheet metal type of stainless steel or compatible with material being fastened, with integral EPDM washers.
   4. Rivets: Stainless steel and cadmium plated material, closed end type of sizes recommended by sheet metal manufacturer to suit application.

E. Clips:
   1. Continuous Cleat (coping/fascia): Minimum 22-gauge, G-90 galvanized finish. 050 aluminum or stainless steel. Match material of coping/fascia and provide one (1) gauge heavier.

2.4 RELATED MATERIALS

A. Solder: ASTM B32, alloy grade 58, 50 percent tin, 50 percent lead.

B. Flux:
   1. Phosphoric acid type, manufacturer's standard.
      a. For Use with Steel or Copper: Rosin flux
      b. For Use with Stainless Steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.

C. Underlayment:
   1. Underlayment shall be min. 40 mil thick fully adhered CladGard SA or approved equal; provide primers, adhesives and accessories as recommended by manufacturer to suite the application.

D. Adhesives: Type recommended by flashing sheet manufacturer seaming and adhesive application of flashing sheet to ensure adhesion and watertightness.

E. Metal Accessories: Sheet metal clips, straps, anchoring devices, clamps and similar accessories required for the complete installation of work, matching or compatible with material being installed, non-corrosive, size and gauge recommended by installer to suit application and performance.

F. Sealant:
   1. Type A:
      a. Type: One-part, non-sag, moisture-curing polyurethane sealant.
      b. Approved Products / Manufacturers: “Chem-Calk 900” manufactured by Bostik Construction Products Division, “Vulkem 921” manufactured by Mameco International, Inc., “Dynatrol I” manufactured by Pecora Corporation, “NP 1” manufactured by Sonneborn Building Products, or approved equal.
   2. Type B:
      a. Type: One-part, neutral-curing, medium-modulus silicone sealant for sealing metal to metal surfaces, i.e. metal edge, cover plates, etc.
      b. Approved Products / Manufacturers: “Chem-Calk 1200” manufactured by Bostik Construction Products Division, “795 Silicone Building Sealant” manufactured by Dow Corning Corporation, “895 Silicone” manufactured by Pecora Corporation, “Omniseal” manufactured by Sonneborn Building Products, “Spectrem 2” manufactured by Tremco Incorporated, or approved equal.

G. Grout - Pitch Pans:
   1. Type: Quick-setting, non-shrink, non-metallic, high strength formula complying with ASTM C1107.
   2. Approved Products/Manufacturers: “Sure Grip High Performance Grout” manufactured by Dayton Superior Corporation, “Premier Quick-Trim” manufactured by L & M Construction Chemicals, Inc., “Masterflow” manufactured by Master Builders, Inc., “Sonnogrout 10K” manufactured by Sonneborn Building Products, or approved equal.

H. Pitch Pan Filler:
   1. Type: Pourable polyurethane sealer, approved by roofing system manufacturer.
   2. Approved Products/Manufacturers: “Pourable Sealer” manufactured by Elevate, or approved equal.

I. Termination Bar:
   1. Material: Stainless steel or extruded aluminum bar with lipped profile
   2. Size: 0.090 inch thick by 3/4 inch wide with 3/16-inch lip width and a 45-degree lip angle, factory punched 1/4-inch x 3/8 inch oval holes spaced six (6) inches on center.
   3. Approved Product/Manufacturer: “LIPTB 06” manufactured by Olympic Manufacturing Group, Inc., or approved equal.

J. Pipe Hangers and Supports: Refer to Section 07 72 00, Roof Accessories.

K. Retro-fit Drains: Refer to Section 07 72 00, Roof Accessories.

2.5 FABRICATION

A. Except as otherwise indicated, fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed shop drawings. Form all flashings, receivers and counterflashings in accordance with standards set forth in the NRCA roofing manual and SMACNA.

B. Comply with manufacturer's installation instructions and recommendations.

C. Unless noted otherwise, fabricate perimeter edge/fascia, scuppers, gutters, downspouts, copings, and trim from pre-finished aluminum sheet.

D. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edges, counterflashing, and coping caps.

E. Fabricate items to size and dimensions as indicated on the drawings. Limit single-piece lengths to ten (10) feet.

F. Face of any fabricated vertical metal fascia or coping shall not exceed 8" without stiffener band or bird's beak. If stiffener band or bird's beak cannot be fabricated, contractor to use multiple pieces of metal to achieve overall distance without going over the 8" maximum per piece.

G. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work sufficient to permanently prevent leakage, damage or deterioration of the work.

H. Integrate flashing in a manner consistent with detailing. Form work to fit substrates.

I. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.

J. Fabricate items with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.

K. Fold back edges on concealed side of exposed edge to form hem.

L. Unless noted otherwise, lap joints minimum three (3) inch. Lap joints to have sealant installed as per details, to maintain watertight condition, inside and outside corners and elevation changes to be riveted and soldered.

M. Seams:
   1. Wherever possible, fabricate non-moving seams in sheet metal with flat-lock seams and end joints.
   2. Pre-finished Steel Metal: Seal pre-finished metal seams with rivets and silicone sealant.
   3. Metal Other than Aluminum: Tin edges to be seamed, form seams, and solder.

N. On Kynar 500 or Hylar 5000 pre-finished metal, surface sand metal flanges prior to applying any primers. Prime all metal in contact with bituminous material.

O. Backpaint all concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.

P. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than one (1) inch deep filled with mastic sealant concealed within joints.

2.6 FABRICATED ITEMS

A. Metal Flashings:
   1. Through wall Receiver Tray: Minimum 24-gauge stainless steel, through wall receivers shall not extend past the face of the exterior veneer more than ¾".
   2. Counterflashing: Minimum 24-gauge prefinished steel.

B. Wind Clips: Minimum 24-gauge Steel to match material of counterflashing, one (1) inch wide by length to engage counterflashing a minimum of 1/2 inch. To be installed at all wall flashings and at curb flashing lengths longer than 5 feet.

C. Roof Penetrations:
   1. Umbrella Counterflashing: Two-piece construction of minimum, 24-guage prefinished steel fabricated in accordance with drawings or project requirements.
   2. Pitch Pans:
      a. 24-gauge membrane clad galvanized metal.
      b. Fabricate to provide installed minimum clear inside perimeter dimension of two (2) inches on each side of penetrating element.
      c. Fabricate pans to at least six (6) inches above the finished roof membrane and with 1/4-inch hem at top edge and with four (4) inch flanges. Round all corners of flange.
      d. Fabricate metal bonnets for all pans, NO EXCEPTIONS. Fabricate bonnets with metal compatible with metal to which bonnet is to be attached. On beams and other steel, weld in place bonnets fabricated from 1/4-inch steel plate. Draw band bonnets fabricated from 24-gauge steel may be used on circular projections.

D. Metal Edge:
   1. RE: 07 62 13

E. Vent Hoods, Sleeves, Penetration Flashings, and Accessories: Minimum 24-gauge steel, or as shown or directed otherwise.

F. Angle Termination Bar: One (1) inch x one (1) inch 24-gauge galvanized steel.

G. Coping:
   1. RE: 07 62 13

H. Gutters, Downspouts and Collector Heads:
   1. Gutters and Downspouts: 0.040-gauge pre-finished aluminum metal. Match existing size. Minimum five (5) inch x six (6) inch box gutter (verify size meets rainfall data per SMACNA).
   2. Gutter Straps: 0.050-gauge pre-finished aluminum metal. (Hem both sides)
   3. Gutter Supports: 0.040-gauge pre-finished aluminum metal. Hemmed around 1/8-inch galvanized bent steel bracket.
   4. Collector Head: 0.040-gauge pre-finished aluminum metal.

I. Pipe Box Cover: 24-guage prefinished Steel

J. Heat Exhaust Curbs and Hoods: 22-gauge prefinished steel.

K. Expansion Joint Cover: Field membrane. Backer rod 2.5 times width of opening with roof membrane lapped minimum 6” on each side heat welded to flashing membrane. Refer to roof details and manufactures recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify substrates are smooth and clean to extent required to perform sheet metal work.

B. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set in place.

C. Verify that reglets, nailers, cants, and blocking to receive sheet metal are in place and free of concrete and soil.

D. Do not start work until conditions are satisfactory.

3.2 PREPARATION

A. Field measure site conditions prior to fabrication work.

B. Install starter and edge strips and cleats before starting installation.

3.3 INSTALLATION

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4-inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Prefabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than three (3) feet from actual corner. Laps shall be one (1) inch, riveted and soldered at following locations:
   1. Prefabricated corners;
   2. transitions;
   3. changes in direction, elevation, and plane; and
   4. at intersections.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners wherever possible; and set units true to line and level as indicated. Install work with laps, joints, and seams which are permanently watertight and weatherproof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from dissimilar metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials which are incompatible with roofing system.

E. Continuous Cleat: At exposed edges of perimeter edge, fascias, cap flashings, and where required, attach continuous cleat at six (6) inches on center with appropriate fasteners. At a distance of 10 feet from each direction of all corners, install fasteners spaced at 3 inches on center. Install cleat so fascia extends a minimum of 1 inch below top of exterior wall finish.

F. Counterflashing:
   1. Do not use surface mount counterflashing.
   2. Set in through wall with receiver and spring lock counterflashing, as detailed in drawings and to NRCA roofing manual, SMACNA standards.
   3. Coordinate installation of through-wall flashing with the masonry contractor.
   4. Seal through-wall in conjunction with masonry wall waterproofing.
   5. Install wind clips 30 inches o.c. at all counterflashing over five (5) feet in length.

G. Pitch Pans:
   1. Apply sealant under pitch pan flange at least 1/2 pound per linear foot.
   2. Prime all metal flanges with primer prior to flashing installation.
   3. Clean all projections enclosed in pitch pans in any manner suitable and coated with a rust inhibitive coating as approved by the Architect. Coating shall be allowed to dry prior to pitch pan fill.
   4. Fill base of pitch pans with grout or cementitious binder and allow to cure.

5. Top Finish Fill: Self-leveling, one-part urethane; at least two (2) inches to top of pitch pan sides.
1. Strip in flange with specified stripping plies with Membrane extending 6 inches from the outer edge of the flange and butt base of pitch pan.

H. Pipe Box:
1. Construct using membrane clad 24-gauge galvanized metal.
2. Height shall be six (6) inches minimum above roof surface.
3. Install with flanges fastened to deck.
4. Fill pans with grout to a height of 3/4 inch of the total pan height.
5. Fill remaining height of pitch pans with specified pitch pan filler.
6. Install hood over pan securing to each side with self-tapping screws.
7. Install face plate to cover box opening around pipe penetrations.
8. Strip in with membrane material.

I. Gutters, Downspouts and Collector Heads:
1. Install gutters, downspouts and collector heads in accordance with details and to standards set forth in the NRCA and SMACNA Manuals.

3.4 CLEANING AND PROTECTION

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean of stains.

B. Remove scraps and debris and leave work area clean.

C. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. Paint areas where finish is damaged on pre-finished metal by painting with a compatible paint in color to match undamaged finish.

D. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

E. Paint metal flashings that have been soiled with bitumen with aluminized paint.

F. Clean other work damaged or soiled by Work of this Section.

G. Protect finished work from damage.

END OF SECTION

SECTION 07 65 26

SELF-ADHERING SHEET FLASHING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide self-adhering sheet flashing at exterior walls to transition from one assembly to another as required to provide a continuous, sealed building envelope.
   02 Locations include, but are not limited to:
      a. Masonry / brick ledges.
      b. All openings through exterior walls.
      c. As indicated on the Drawings.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 06 10 00 – Rough Carpentry
   03 Section 07 13 53 – Elastomeric Copper Sheet Waterproofing
   04 Section 07 54 19 – Thermoplastic Single Ply Membrane Roofing
   05 Section 07 62 13 – Sheet Metal Flashing
   06 Section 08 80 00 – Glazing
   07 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

D. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

E. Sample Wall Panel: Sample panel shall be 8' long x 6' high panel showing completed through-wall flashing at first course of masonry and dampproofing assembly, complete with exterior sheathing, rigid insulation (where applicable). Coordinate as required with other trades.
   01 Panel shall be “L” shaped (4’ x 4’) with metal stud / drywall back-up wall on one side and CMU back-up on one side.
   02 Once accepted by the Architect, the sample panel shall be the standard by which installed is judged.
   03 Sample panel shall remain at the jobsite until all through-wall flashing and dampproofing is completed.

F. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 WARRANTY

A. Provide a material and labor, non-prorated, manufacturer / installer minimum ten (10) year warranty that material will remain free of defects and installation shall remain water tight.
   01 Defects shall include, but not be limited to delamination, slippage on substrate and / or deterioration of sheet.

PART 2 - PRODUCTS

2.1 SELF ADHERING SHEET FLASHING MANUFACTURERS

A. Design of self-adhering sheet flashing is based on products manufactured by Henry Company.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section, provided proposed products meet or exceed all specified requirements:
   01 Grace Construction Products
   02 Polyguard Products, Inc.
   03 Tremco
   04 Durowall, Inc.

C. Provide primers, glass fabric scrim tape, mastic and other materials not specifically described, as required for a complete and proper installation as recommended by the manufacturer.

2.2 SELF ADHERING SHEET FLASHING

A. By definition for Work covered by this Section, “self-adhering sheet flashing” shall refer to all flexible flashing installed at both through-wall and non-through-wall conditions, unless specified otherwise in other specification sections.
   01 Elastomeric copper sheet waterproofing flashing shall be as specified in Section 07 13 53 – Elastomeric Copper Sheet Waterproofing.
   02 Metallic thru-wall flashing shall be as specified in Section 07 62 13 – Sheet Metal Flashing.

B. Flexible, Self-Sealing Wall Flashing:
   01 Design of self-adhering sheet flashing is based on Henry Company Blueskin TWF Self-Adhesive Thru-Wall Flashing Membrane.

02 Description: Self-adhering, membrane consisting of an SBS rubberized asphalt compound which is integrally laminated to a cross laminated polyethylene (HDPE) film, with a silicone release sheet, specifically designed for thru-wall flashing conditions.
03 Width: Select either 12 inch, 18 inch, 24 inch, 36 inch wide rolls.
04 Thickness: 40 mils. Film thickness: 9 mils.
05 Elongation: 200% minimum (ASTM D412 Die C).
06 Water vapor transmission: 0.03 perms (ASTM E96 Method B).
07 Membrane tensile strength: 800 psi minimum.

C. Primers and Sealants:
01 Provide primers as recommended by the manufacturer for the specific substrate, condition and assembly.
02 Provide sealants as recommended by the manufacturer for the specific substrate, condition and assembly.

D. Termination Bar:
01 1” x 1/8” aluminum or stainless steel flat bar.
02 Pre-drilled to fasten at maximum 16” O.C.
03 Fasteners shall be cadmium plated or stainless steel, self-tapping screws.

PART 3 - EXECUTION

3.1 PREPARATION

A. Working Conditions: Apply under normal working conditions above 45°F and rising. Do not apply when rain is imminent.

B. Storage: Keep container tightly sealed and protect from freezing in shipping and storage.

C. Surface Preparation:
01 All dust, dirt, old loose or scaling coatings shall be removed from the surface before coating or application of thru-wall flashing.
02 All brick ledge conditions shall be free of dirt and dust prior to application of thru-wall flashing.
03 All cracks, joints, penetrations, and splits should be sealed, repaired with 4 inch wide glass fabric scrim tape embedded in Henry Company #789.
04 Dusty or porous masonry surfaces should be dampened with water. Highly porous masonry should be primed with Henry Company #788 Asphalt Primer or #351 Non-fibered Emulsions which has been thinned with 1 gallon water per 5 gallons of #788.
05 Metal surfaces shall be free of rust, cleaned and primed.
06 Architect shall approve the taping of joints and surface preparation prior to the application of the dampproofing.

3.2 LOCATIONS

A. Self-Adhering Sheet Flashing:
01 All foundation masonry / brick ledges. At locations where adjacent concrete flatwork is above the bottom of the brick ledge, two (2) layers shall be applied – one at base of brick ledge and one at the first brick course above the adjacent flatwork.
02 Over heads of openings on steel lintel angles back to wall sheathing / substrate.

03 Under sills and at jambs of openings (not thru wall). Install additional thru-wall flashing at window jambs to lap over the end dams of all sub-sill flashing. Coordinate with window installer as required.
04 At perimeter of building at roof lines and parapets (not thru wall) extending down onto exterior walls (sheathing or CMU as applicable).
05 At all exterior wall conditions as required to divert moisture within wall cavities to the building exterior.
06 At all openings through exterior sheathing / CMU resulting from structural steel or other interfacing work.
07 Bridging building expansion joints that telegraph into exterior back-up wall substrate.
08 Where indicated on Drawings.

B. Termination Bar: Continuous at the top edge of the vertical surface of all thru-wall flashing at all masonry ledges, wall-to-roof masonry conditions and masonry lintels.

C. The completed installation of thru-wall flashing shall render the building watertight except at door and window openings.

3.3 INSTALLATION – SELF-ADHERING SHEET FLASHING

A. Install all self-adhering sheet flashing and dampproofing in strict accordance with the manufacturer's specifications and recommendations.
01 Take all necessary precautions to eliminate fish-mouths and other irregularities. Where they occur, cut out and apply additional layer(s) of thru-wall flashing as required to achieve a smooth surface.
02 Carefully construct corner assemblies and vertical transitions / steps to assure proper lapping of adjacent sheets to provide positive drainage. Lap joints shall be a minimum of 4 inches.
03 All thru-wall flashing shall be installed prior to application of dampproofing.

B. Do not extend self-adhering sheet flashing at masonry / brick ledges and lintels to face of masonry. Cut back 1/2" to 3/4" from exterior face.

C. Carefully coordinate with the Masonry Contractor to install thru-wall flashing at the proper brick course(s). Thru-wall flashing shall form a continuous barrier at all transitions.

3.4 TESTING AND INSPECTING

A. Not more than ten (10) days after completion of this portion of the Work, at the discretion of the Architect, demonstrate by running water test that the Work of this Section will successfully repel water.
01 Notify the Architect at least 48 hours in advance and conduct the test in the Architect's presence.
02 By means of an outrigger, or similar acceptable equipment, place the nozzle of a 3/4 inch garden hose at a point approximately 10'-0" away from top of wall where approved by the Architect, aiming the nozzle at slight downward angle to direct full stream of water onto wall.
03 Run water onto wall at full available force for not less than four hours.
04 Upon completion of the four-hour period, inspect interior surfaces of wall for evidence of moisture penetration.

B. If evidence of moisture penetration is discovered, apply an additional coat of dampproofing to the exterior surface in areas directed by the Architect. Repeat application and testing at no additional cost to the Owner, until no evidence of moisture penetration is found.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: Provide roof accessories as indicated on the Drawings, including, but limited to:
   01 Roof equipment curbs.
   02 Expansion joints.
   03 Roof equipment supports.
   04 Pipe supports.
   05 Roof ladders.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 21 00 – Steel Joist Framing
   03 Section 05 31 00 – Steel Decking
   04 Section 07 54 19 – Thermoplastic Single Ply Membrane Roofing
   05 Section 07 72 23 – Roof Hatches and Vents

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

G. Operations and Maintenance Manuals:
   03 Provide complete operations and maintenance manuals to the Owner.
   04 Refer to Section 01 78 23 – Operations and Maintenance Manuals.
   05 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

1.3 INSTALLATION RESPONSIBILITY

A. In addition to the items normally a part of this Section, coordinate the installation of roof accessory curbs and pipe flashings and equipment supports that may be specified elsewhere.

B. Coordinate the work specified herein with the following Work:
   01 Roofing.
   02 Roofing Sheet Metal.
   03 Mechanical Equipment.
   04 Plumbing.
   05 Light Weight Insulating Concrete.

PART 2 - PRODUCTS

2.1 PREFABRICATED ROOF CURBS

A. Design of roof curbs is based on products manufactured by Thybar Corporation.

B. Acceptable manufacturers: The following manufacturers are acceptable to provide Roof Curbs provided proposed product(s) meet or exceed all specified requirements.
   01 Custom Curb, Inc.
   02 The Pate Co.

C. Curbs: Design is based on Thybar model TC-3 series roof curbs.
   01 Manufactured of galvanized steel meeting ASTM A653 / A653M.
   02 Construction Gauge: Minimum 16 gauge; and heavier where required by size and / or load of equipment. Coordinate as required.
   03 All seams shall be welded continuous to be water and air tight.
   04 Roof curb perimeter shall have a continuous 2" minimum horizontal leg at base for secure attachment to supporting steel framing.
   05 Height: As required to provide a minimum 8" above highest interfacing roof deck. Coordinate with roofer to confirm.
   06 Curbs shall be fabricated for level tops, accounting for pitch of roof steel framing / roof deck as required.
   07 Provide additional angle reinforcing at maximum 48" O.C. as required to support equipment.
   08 All curb walls shall be insulated with minimum 1-1/2" thick 3PCF rigid insulation. Provide interior, protective, sheetmetal liner to cover rigid insulation.
   09 Factory installed wood nailers; minimum 1-1/2" x 1-1/2".

D. Counterflashing Cap: Minimum 18 ga galvanized steel.

E. Coordinate with other trades as required for exact sizes of roof curbs required and load at each location.

F. Pipe Flashing Curbs:
   01 Same type of construction as roof curbs above.
   02 Pipe Seals: ABS cover with graduated neoprene or chlorinated polyethylene boot with two (2) stainless steel adjustable clamps per pipe boot.
   03 Coordinated with other trades as required for exact sizes, pipe quantities and pipe diameters.

2.2 EQUIPMENT SUPPORTS

A. Design of equipment supports is based on products manufactured by Thybar Corporation.

B. Acceptable manufacturers: The following manufacturers are acceptable to provide Roof Curbs provided proposed product(s) meet or exceed all specified requirements.
   01 Custom Curb, Inc.
   02 The Pate Co.

C. Equipment Supports: Design is based on Thybar model TEMS-3 series equipment supports.
   01 Manufactured of galvanized steel meeting ASTM A653 / A653M.
   02 Construction Gauge: Minimum 18 gauge; and heavier where required by size and/or load of equipment. Coordinate as required.
   03 Nominal width: 5”.
   04 All seams shall be welded continuous to be water and air tight.
   05 Equipment supports perimeter shall have a continuous 2” minimum horizontal leg at base for secure attachment to supporting steel framing.
   06 Height: As required to provide a minimum 8” above highest interfacing roof deck. Coordinate with roofer to confirm.
   07 Equipment supports shall be fabricated for level tops, accounting for pitch of roof steel framing / roof deck as required.
   08 Internal bulkhead reinforcement as required for imposed load.
   09 Factory installed, treated 2x6 wood nailer, continuous.

D. Counterflashing Cap: Minimum 24 gauge stainless steel.

E. Coordinate with other trades as required for exact sizes of roof curbs required and load at each location.

2.3 PIPE SUPPORTS

A. Design of pipe supports is based on products manufactured by PHP Systems / Design (PHPSD).

B. Design of pipe supports is based on PHPSD Pipe Supports as follows:
   01 Series SS-8 for lines 2-1/2” or less.
   02 Series PP-10 for lines up to 3-1/2”.
   03 Series RB-18 for lines 4” to 6”.

C. Roller type pipe support specifically designed for installation without roof penetrations or flashing.

D. Base Material: high density / high impact polypropylene with integral UV protection.

E. Minimum 12 gauge, channel type steel framing with roller system. Hot dipped galvanized after fabrication.

F. Provide accessory clamps, bolts, nuts, washers and other devices required for a complete installation.

G. Provide protective traffic pads at each pipe support as recommended by roofing system manufacturer. Coordinate with other trades as required.

2.4 ROOF LADDERS

A. Design of roof ladders is based on products manufactured by Alaco Ladder Company.

B. Acceptable Manufacturers: The following manufacturers are acceptable provide proposed products meet or exceed all specified requirements.
   01 Louisville Ladder Corp.
   02 O'Keefe's Inc.
   03 Precision Stair Corp.

C. Design of Roof Ladders is based on Alaco Ladder Company Model 561 – Fixed Roof Ladder – Handrails Over Roof.
   01 Coordinate with roofing installer to provide protection at roof connection as required to maintain integrity of roofing system.

D. Comply with all OSHA/ANSI safety standards.

E. Aluminum ladders and their components are fabricated from 6061-T6 aluminum alloy for added safety, strength and long-lasting durability, with no painting required.

F. Fixed wall ladders include side rails with 1-1/8" (29 mm) round rungs that are serrated and secured with cast aluminum connectors, 4 solid rivets and 3/8" (9.5 mm) thick brackets mounted to the walls.

G. Finish: Mill finish aluminum to be field painted.

H. Provide aluminum ladders at roof level changes as detailed and indicated on the Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate all trades as required for proper design, sizing and locations of equipment curbs and equipment supports.
   01 Coordinate with Steel Fabrication and Erection Contractors to provide a continuous bearing all 4 sides of equipment curbs. Minimum size: 3-1/2x3-1/2 x 1/4" angle.
   02 Coordinate with Steel Fabrication and Erection Contractors to provide a continuous bearing all below sides of equipment supports. Minimum size: 3-1/2x3-1/2 x 1/4" angle.
   03 Coordinate with Roofing Contractor for proper flashing and interface with equipment curbs and supports.

B. Coordinate all trades as required for types, sizing and locations of roof ladder anchoring into exterior walls.
   01 Set anchoring devices in place prior to installation of weather barrier to assure a weather-tight seal at anchors.

3.2 INSTALLATION

A. Install all roofing according in strict accordance with manufacturer's printed instructions and final reviewed Shop Drawings.

B. Coordinate with roofing operation for flashing and interface to provide a watertight installation.

C. Install sealant conforming to FS TT-S-00227E, Type II, Class A, as required.

END OF SECTION

SECTION 07 72 23

ROOF HATCHES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide roof hatches at locations where indicated on the Drawings.
   02 Provide associated wall anchored access ladders below roof hatches.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 21 00 – Steel Joist Framing
   03 Section 05 31 00 – Steel Decking
   04 Section 07 54 19 – Thermoplastic Single Ply Membrane Roofing.
   05 Section 07 72 00 – Roof Accessories

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Operations and Maintenance Manuals:
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 WARRANTY

A. Provide manufacturer's material warranty. Materials and assemblies shall be free of defects in material and workmanship for a period of four (4) years minimum from the date of Substantial Completion.

B. Defects shall include, but not be limited to, the following:
   01 Noticeable deterioration of finish.
   02 Leakage of water into the building or within the hatch factory construction / assembly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design of roof hatches is based on products manufactured by The Bilco Co.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide the product(s) of this Section, provided proposed products meet or exceed all specified requirements.
   01 Cierra / Babcock-Davis
   02 Hillsdale Industries
   03 Inland-Ryerson Construction Products Co.
   04 Milcor, Inc.
   05 Wasco Products, Inc.

2.2 MATERIALS – ROOF HATCH

A. Roof Hatch:
   01 Design of roof hatches is based on The Bilco Co. Model E-50TB single leaf, thermally broken roof hatch assembly.
   02 The roof hatch shall be factory assembled, complete with all accessories required for a complete installation; and suitable for direct interface with designed structural support and roofing system. Coordinate as required.
   03 Size: 36" x 36".

B. Performance Characteristics:
   01 Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
   02 Cover shall be reinforced to support a minimum live load of 40 PSF with a maximum deflection of 1/150th of the span or 20 PSF wind uplift.
   03 Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
   04 Operation of the cover shall not be affected by temperature.
   05 Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

C. Cover:
   01 Shall be 11-gauge aluminum with a 5" beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation.

02 Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

03 Cover insulation shall be 3” thick polyisocyanurate with minimum R-value of 18, fully covered and protected by an 18-gauge aluminum liner.

D. Curb:

01 Shall be 12” in height and of 11-gauge aluminum.

02 Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation.

03 The curb shall be formed with a 5-1/2” flange with 7/16” holes provided for securing to the supporting structure substrate.

04 The curb shall be equipped with an integral metal cap-flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6” on center, to be bent inward to hold single ply roofing membrane securely in place.

05 Curb insulation shall be 3” thick polyisocyanurate with minimum R-value of 18, fully covered and protected by an 18-gauge aluminum liner.

E. Lifting Mechanism:

01 Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing.

02 The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

F. Hardware:

01 Heavy stainless steel pintle hinges shall be provided.

02 Cover shall be equipped with a spring latch with interior and exterior turn handles.

03 Roof hatch shall be equipped with interior and exterior padlock hasps.

04 The latch strike shall be a stamped component bolted to the curb assembly.

05 Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1” diameter red vinyl grip handle to permit easy release for closing.

06 Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.

07 Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

G. Ladder Safety Post:

01 Provide roof hatch with a manufacturer’s preassembled ladder safety post. Design is based on The Bilco Co. model LU-1 ladder safety post.

02 Performance Characteristics:

a. Tubular post shall lock automatically when fully extended.

b. Safety post shall have controlled upward and downward movement.

c. Release lever shall disengage the post to allow it to be returned to its lowered position.

d. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14” (356mm) on center and clamp brackets to accommodate ladder rungs up to 1-3/4” (44mm) in diameter.

03 Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.

04 Material of construction: Shall be aluminum, Model LU-4.

05 Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.

06 Hardware: All mounting hardware shall be Type 316 stainless steel.
07 Finishes: Factory finish shall be yellow powder coat steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance.
   01 Coordinate with steel erector and roofing contractor as required.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
   01 Test units for proper function and adjust until proper operation is achieved.
   02 Test fusible link and install replacement fusible link after testing.
   03 Repair finishes damaged during installation.
   04 Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

B. Provide testing of the heat / smoke vents as required by the local authority having Jurisdiction. When required, replace fusible links after testing is completed and approved.

END OF SECTION

SECTION 07 81 16

CEMENTITIOUS FIREPROOFING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all labor, materials, equipment and services necessary for, and incidental to, the complete and proper installation of all spray-applied fire resistive materials and related work as shown on the Drawings or where specified herein, and in accordance with all applicable requirements of the Contract Documents.
   02 The material and installation shall conform to the applicable building code requirements and the requirements of all authorities having jurisdiction.

C. Related Work:
   03 Section 05 12 00 – Structural Steel Framing
   04 Section 05 41 00 – Structural Metal Stud Framing
   05 Section 05 50 00 – Metal Fabrication.
   06 Section 07 81 23 – Intumescent Fireproofing
   07 Section 07 84 13 – Penetration Firestopping

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. UL Designs: Submit manufacturer's literature indicating applicable U.L. designs to meet required levels of fire resistance and minimum thickness for each steel member size and assemblies shown on the Drawings.

D. Test Data: Independent laboratory test results shall be submitted for all specified performance criteria.

E. Certificate of Non-Contamination: The manufacturer shall submit an affidavit certifying that all materials are 100% asbestos free.

F. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

G. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

H. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

I. UL Designs: Submit manufacturer's literature indicating applicable U.L. designs to meet required levels of fire resistance and minimum thickness for each steel member size and assemblies shown on the Drawings.

J. Test Data: Independent laboratory test results shall be submitted for all specified performance criteria

K. Certificate of Non-Contamination: The manufacturer shall submit an affidavit certifying that all materials are 100% asbestos free.

1.3 QUALITY ASSURANCE

A. Work shall be performed by a firm with expertise in the installation of fire protection or similar materials. This firm shall be licensed or otherwise approved by the spray-applied fire resistive material manufacturer.

B. Design and governmental permitting are based on specific U.L. designs correlating to the product(s) specified. Equivalent product(s) from other listed manufacturers, along with their corresponding U.L. designs shall be allowed, provided they do not materially alter the design of the specified or indicated assembly.
   01 If the permitting authority requires revisions to the permit documents due to revised U.L. designs, the Contractor shall be responsible to coordinate and obtain required governmental approvals.

C. Thicknesses of sprayed-on cementitious fireproofing shall be tested by the materials testing lab contracted with the Owner.

1.4 REFERENCES

A. The Work of this Section shall comply with the following:
   01 ASTM E84 – Surface Burning Characteristics of Building Materials.
   02 ASTM E119 – Fire Tests of Building Construction and Materials.
   03 ASTM E605 – Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.
   04 ASTM E736 – Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
   05 ASTM E759 – Effect of Deflection of Sprayed Fire-Resistive Materials Applied to Structural Members.
   06 ASTM E760 – Effect of Impact on the Bonding of Sprayed Fire-Resistive Materials Applied to Structural Members.
   07 ASTM E761 – Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.

08 ASTM E859 – Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members.
09 ASTM E937 – Corrosion of Steel by Sprayed Fire-Resistive Materials Applied to Structural Members.
10 ASTM E1354 – Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter.
11 ULC/CAN S101 – Standard Methods of Fire Tests of Building Construction and Materials.
12 ULC/CAN S102 -Steiner Tunnel Test.
13 ULC/CAN 4-S114 – Standard Test Method for Determination of Non-combustibility in Building Materials.
14 Underwriters Laboratories, Inc. (UL) Fire Resistance Directory.
15 Underwriters Laboratories of Canada (ULC) List of Equipment and Materials.
16 International Building Code – Houston.
17 AWCI Publication: Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials. Technical Manual 12-A; an annotated guide.

B. All materials, application and work shall comply with Table 601, IBC, year / edition having jurisdiction over this project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaging shall bear the UL and ULC labels for fire hazard and fire-resistance classifications.

B. Store materials above ground, in a dry location, protected from weather, moisture and areas of high humidity. Damaged packages found unsuitable for use should be rejected and removed from the project.

1.6 PROJECT CONDITIONS

A. When the prevailing outdoor temperature at the building is less than 40°F (4°C), a minimum substrate and ambient temperature of 40°F (4°C) shall be maintained prior to, during and a minimum of 24 hours after application of the spray-applied fire resistive material. If necessary for job progress, General Contractor shall provide enclosures with heat to maintain temperatures.

B. Provide ventilation to allow proper drying of the spray-applied fire resistive material during and subsequent to its application.

C. Ventilation shall not be less than 4 complete air exchanges per hour until the SFRM is fully cured. When spraying in enclosed areas such as basements, stairwells, shafts and small rooms, additional air exchanges may be necessary.

1.7 SEQUENCING / SCHEDULING

A. The Contractor is responsible for scheduling fireproofing work.

B. The Contractor shall coordinate all trades as required for the installation of work preceding and succeeding fireproofing work as required to maintain the integrity of the fireproofing application and adherence to U.L. design requirements.

C. All fireproofing removed and / or damaged as the result of other work shall be repaired using the same fireproofing material as required to comply with U.L. designs.

D. Use all necessary means to prevent fireproofing material from being applied to materials not scheduled to receive it. Removal all fireproofing from such materials. In the event of damage, make all necessary repairs and / or replacements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS / MATERIALS

A. Isolatek International:
   01 Standard Density: CAFCO 300.
   02 Medium Density: CAFCO 400.

B. W. R. Grace Construction Products:
   01 Standard Density: Monokote MK-6.
   02 Medium Density: Monokote Z-106HY.

C. Carboline, Southwest Fireproofing:
   01 Standard Density: Type 5 GP.
   02 Medium Density: Type 7 GP.

D. The manufacturer providing the fire-proofing material must submit applicable UL designs specific to their product(s).

2.2 MATERIALS

A. Materials shall be applied to conform to the Drawings, Specifications and following minimum test criteria:

01	Flame Spread:	ASTM E84	0
02	Smoke Developed:	ASTM E84	0
03	Density	E605	15 PCF (SD) / 22 PCF (MD)
04	Cohesion / Adhesion	E736	150 PSF (SD) / 430 PSF (MD)
05	Deflection	E759	No Cracks or Delamination
06	Bond Contact	E760	No Cracks or Delamination
07	Compressive Strength	E761	2,800 PSF (SD) / 10,000 PSF (MD)
08	Corrosion Resistance	E937	Does not promote corrosion
09	Combustibility	E1354	Noncombustible

   10 The material shall have been tested and reported by Underwriters Laboratories, Inc. (UL) or Underwriters Laboratories of Canada (ULC) in accordance with the procedures of UL 263 (ASTM E119) or CAN4-S101.

B. Standard Density materials may be applied generally at concealed locations as follows:
   01 Encapsulated in masonry or gyp board assemblies.
   02 In plenums between ceiling and structure / deck above.
   03 Other locations not subject to exposure to room occupants.

C. Medium Density materials shall be applied at all rooms / areas / materials exposed to room occupants and other locations as follows:
   01 Rooms or areas exposed to structure above.
   02 Rooms or areas with partial ceilings.
   03 Steel members at the building perimeter walls.
   04 Materials / areas that may be exposed to weather prior to cover-up.

D. Potable water shall be used for the application of spray-applied fire resistive materials.

E. Spray-applied fire resistive materials shall be free of all forms of asbestos, including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Material manufacturer shall submit certification of such.

PART 3 - EXECUTION

3.1 U.L. DESIGNS AND LOCATIONS

A. Definitions:
   01 Structural Frame: all columns and the girders, beams, trusses and spandrels having direct attachment to the column, and bracing members designed to carry gravity loads.
   02 Secondary Members: all members directly supporting floor or roof decks / panels which have no connection to the columns.

B. Provide required thickness and application of sprayed fireproofing at the following locations based on the UL designs listed on sheet G1.01 – Code Analysis

C. Fireproofing is not required at the following locations unless specifically noted:
   01 Exterior canopies.
   02 Roof structure that is 20’-0” or greater above finish floor immediately below assembly; exclusive of columns which shall be fireproofed full height.
   03 Where a partial raised floor encroaches in the 20’-0” clearance, the entire structural bay(s) above the partial raised floor shall be fireproofed.
   04 At locations indicated or specified to receive Intumescent fireproofing.

D. Alternate, manufacturer-specific product tested UL designs shall be acceptable provided they comply with the provisions of this Section and are equivalent designs to those specified.

3.2 PREPARATION

A. All surfaces to receive fire protection shall be free of oil, grease, loose mill scale, dirt, paints/primers (other than those listed and tested) or other foreign materials, which would impair satisfactory bonding to the surface.
   01 Manufacturer shall be contacted for procedures on handling primed/painted steel.

B. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others trades prior to the application of spray-applied fire resistive materials. Coordinate all trades as required.

C. The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of sprayed fire protection is completely cured in an area.

D. The spray-applied fire resistive material shall only be applied to steel deck which has been fabricated and erected in accordance with the criteria set forth by the Steel Deck Institute.

E. When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.

3.3 APPLICATION

A. Equipment, mixing and application shall be in accordance with the manufacturer's written application instructions.

B. The application of spray-applied fire resistive material shall not commence until certification has been received by the General Contractor that surfaces to receive sprayed fire protection have been inspected by the applicator and are acceptable to receive sprayed fire protection.

C. All unsuitable substrates must be identified and made known to the General Contractor and corrected prior to the application of the spray-applied fire resistive material.

D. Fire protection shall not be applied to steel floor decks prior to the completion of concrete work on that deck.

E. The application of spray-applied fire resistive material to the underside of roof deck shall not commence until the roof is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and construction roof traffic has ceased.

F. Proper temperature and ventilation shall be maintained as specified in Paragraph 1.6 above.

G. Provide masking, drop cloths or other suitable coverings to prevent overspray from coming in contact with surfaces not intended to be sprayed.

H. Bonding materials (adhesives, catch coats, metal lath, mesh, stud pins, etc.) shall be applied as per the appropriate UL/ULC fire resistance design and manufacturer's written recommendations. A letter from the mesh manufacturer is required for proof of non-combustible materials.

I. Topcoat material, if any, shall be the type recommended and approved by the manufacturer of each spray-applied fire resistive material required for the applications indicated.

3.4 REPAIRING AND CLEANING

A. Provide follow-up application to patch and / or repair fireproofing that has been damaged by other trades. Required thicknesses apply after all interfacing work is complete.

B. After the completion of the Work in this Section, equipment shall be removed and all surfaces not to be sprayed shall be cleaned to the extent to allow proper installation of subsequent work as approved by the Architect.

3.5 INSPECTION AND TESTING

A. The spray-applied fire resistive material shall be tested for thickness and density in accordance with one of the following procedures:
   01 ASTM E605 – Standard Test Method for Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.
   02 AWCI – Inspection Procedure for Field-Applied Sprayed Fire-Resistive Materials, Technical Manual 12-A; an annotated guide.

END OF SECTION

SECTION 07 81 23

INTUMESCENT FIREPROOFING

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1- GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide intumescent fireproofing as indicated in the Contract Documents as required to meet designated fire ratings.
   02 Provide intumescent fireproofing at exposed interior primary steel framing – beams and columns within 20'-0" above nearest finish floor.
   03 All primary framing concealed behind drywall framing and ceilings shall be fireproofed with cementitious sprayed fire proofing.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 21 00 – Steel Joist Framing
   03 Section 05 31 00 – Steel Decking
   04 Section 07 81 16 – Cementitious Fireproofing
   05 Section 07 84 13 – Penetration Firestopping
   06 Section 09 91 00 – Painting and Re-Painting

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each top cost finish for selection by the Architect.

02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3”, but must be large enough to convey attributes of the proposed product.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten (10) years of documented experience.

B. Installer Qualifications: Approved, certified, or supervised by manufacturer of intumescent fireproofing, with not less than five (5) years of documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers with identification labels and testing agency markings intact and legible.

B. Store products in manufacturer's unopened packaging until ready for installation.
01 Store at temperatures not less than 50°F in dry, protected area.
02 Protect from freezing, and do not store in direct sunlight.
03 Dispose of any materials that have come into contact with contaminants of any kind prior to application.

1.5 PROJECT CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s absolute limits.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Design of Intumescent Fireproofing is based on products manufactured by Isolotek International.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed all specified requirements.
01 Albi
02 Carboline
03 Contego
04 W.R. Grace

2.2 SYSTEM REQUIREMENTS

A. Fire resistance rating of up to 3-hour fire rating for all primary steel framing columns and beams exposed view in the completed Work.
01 Fireproofing is not required on structural steel more than 20’-0” above the immediate finish floor below.

2.3 MATERIALS

A. Design of intumescent fireproofing is based on Isolotek Type WB 5 Intumescent Coating.

B. Interior Fire-Resistive Coating System: Water-based, asbestos-free, factory-mixed thin film intumescent coating system with smooth and, uniform finish texture.
   01 Surface Burning Characteristics, when tested in accordance with ASTM E 84:
      a. Flame Spread Index: 5 per ASTM E84.
      b. Smoke Developed Index: 30 per ASTM E84.
      c. Cohesion / Adhesion: 340 PSI per ASTM D4541.
      d. Durometer Hardness: 69 Shore D per ASTM D2240.
      e. Impact Resistance: 152 IN-LB per ASTM D2794.
      f. Abrasion Resistance: 0.2600 g / 1000 cycles per ASTM D4060.

C. Primer: As required by tested and listed assemblies, and as recommended by fireproofing manufacturer to suit specific substrate conditions.

D. Protective and Decorative Top Coating: As recommended by fireproofing manufacturer for exposure conditions.
   01 Coordinate with painting manufacturer and contractor as required to assure compatibility and proper installation.
   02 Color and Gloss: Match Architect's sample.
   03 Coordinate with paint specified in Section 09 91 00 – Painting and Re-Painting for color and sheen match between steel coated with intumescent coating and adjacent painted surfaces.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fireproofing. Verify that they are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Thoroughly clean surfaces to receive fireproofing.

B. Repair substrates to remove surface imperfections that could, affect uniformity of texture and thickness of fireproofing system.

C. Remove minor projections and fill voids that could telegraph through the finished Work.

D. Cover or otherwise protect other Work that might be damaged by fallout or overspray of fireproofing system.

E. Provide temporary enclosures as necessary to confine Operations and maintain required environmental conditions.

3.3 INSTALLATION

A. Comply with manufacturer's instructions for particular conditions of installation in each case.

B. Apply manufacturer's recommended primer to required coating thickness.

C. Apply fireproofing to full thickness over .entire area of each substrate to be protected.

D. Apply intumescent fireproofing by spraying to maximum extent possible. If necessary, complete coverage by roller application or other method acceptable to manufacturer.

E. Achieve uniform finished appearance complying with approved mock-up.

3.4 CLEANING AND PROTECTION

A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

B. Protect installed intumescent fireproofing from damage due to subsequent construction activities, so fireproofing is without damage or deterioration at time of Substantial Completion.

C. Touch-up, repair or replace damaged products before date of Substantial Completion.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Furnish all materials and labor required for installation of firestops around through wall - penetrations of pipe, duct, cable, cable tray, conduit, other electrical devices, blank openings and at the periphery of all fire-rated walls, floors, partitions and floor/ceiling assemblies.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 04 20 00 – Unit Masonry
   03 Section 07 81 16 – Cementitious Fireproofing
   04 Section 07 92 00 – Joint Sealants
   05 Section 09 21 16 – Gypsum Board Assemblies
   06 Division 22 – Plumbing
   07 Division 23 – Heating, Ventilating and Air-Conditioning
   08 Division 26 – Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Submit a copy of UL illustration of each proposed system indicating manufacturer approved modifications.

D. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies. Show details of field applications for all various conditions.

E. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

F. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.

01 Include recommended cleaning products and instructions for use.
02 Where applicable, provide recommended maintenance schedules and procedures.

1.3 QUALITY ASSURANCE

A. Standards:
01 ASTM E814 – Standard Method for Fire Tests of Through - Penetration Fire Stops.
02 ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
03 UL 1479 – Fire Tests of Through-Penetrations Firestops.
04 UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
05 UL Fire Resistance Directory; Through – Penetration Firestop Systems (XHEZ), and Fill, Void or Cavity Materials (XHHW).
06 NFPA 101 – Life Safety Code.
07 NFPA 70 – National Electric Code.

B. Performance:
01 Firestop systems shall provide a fire resistance rating at least equal to the hourly resistance rating of the fire-rated barrier.
02 Firestop Systems shall have been tested in accordance with ASTM E814 or UL 1479 under a minimum positive pressure of 0.01 in. of water.

1.4 DEFINITIONS

A. Penetration: Any opening of foreign material passing through or into a fire-rated barrier.

B. Fire-Rated: Have the ability to withstand the effects of a standard fire exposure for a specified time period, as determined by qualified testing.

C. Fire-Rated Barrier: A floor, wall, partition or floor-ceiling assembly able to withstand a standard fire and hose stream test without failure.

D. Fire Resistance Rating: The ability of a structure to act as a barrier to the spread of fire and to confine it to the area of origin. Ratings are expressed in hours and apply to beams, columns, floors, roofs, walls and partitions.

E. Firestopping: A means of sealing openings in fire-rated barriers to preserve or restore the fire resistance rating.

F. Firestop System: A material, or combination of materials, installed to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke or gases through penetrations in fire-rated vertical barriers It should be used in specific locations as follows:
01 Penetrations for the passage of duct, cable, cable tray, conduit, piping and electrical bus-ways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor slabs and floor/ceiling assemblies), and vertical service shafts.
02 Openings between floor slabs and curtain walls.
03 Openings between structurally separate sections of walls of floors.
04 Gaps between the top of walls and ceiling or roof assemblies.
05 Vertical service shafts at each floor level.
06 Expansion joints in walls and floors.
07 Openings and penetrations in fire-rated partitions or walls containing fire doors.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, grade, and UL label where applicable.

B. Coordinate delivery with scheduled installation date to allow minimum storage time at site.

C. Store materials in clean, dry, ventilated location. Protect from soiling, abuse, and moisture. Follow manufacturer's instructions.

1.6 PROJECT CONDITIONS

A. Existing Conditions:
   01 Verify existing conditions and substrates before starting Work. Correct unsatisfactory conditions before proceeding.
   02 Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

B. Environmental Requirements:
   01 Furnish adequate ventilation if using solvent.
   02 Furnish forced air ventilation during installation if required by manufacturer.
   03 Keep flammable materials away from sparks or flame.
   04 Provide masking and drop cloths to prevent contamination of adjacent surfaces by fire stopping materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of penetration firestopping sealants is based on products manufactured by Hilti Construction Chemicals, Inc.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provided proposed products meet or exceed all specified requirements.
   01 3M Corporations
   02 Rectoseal
   03 Tremco

2.2 MATERIALS

A. Firestopping materials / constructions shall constitute one or more of the following products or equal by other listed manufacturers.
   01 Hilti CFS-S SIL GG Firestop Sealant: An adhesive, one-part, silicone-based, elastomeric sealant.
   02 Hilti FS ONE Intumescent Wrap: An Aluminum foil-backed intumescent strip for plastic or insulate pipe.
   03 Hilti CP 620 Filling and Sealing Foam or fire-tested designs.

B. Firestopping materials shall be asbestos-free, emit no toxic or combustible fumes and be capable of maintaining an effective barrier against flame, smoke, gas, and water in compliance with previously referenced standards.

C. Firestopping materials /systems shall be flexible to allow for normal movement of building structure and penetrating item(s) without affecting the adhesion or integrity of the system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrate surfaces to ensure proper and adequate structural support for the specified UL Rated Firestop System. Install fire-rated partitions /floors with void to receive firestop system.

B. Clean surfaces from all foreign materials i.e., loose debris, dirt, oil, grease, wax and/or oil caulking before sealant is applied.

C. Field measure and verify dimensions as required.

D. Protect adjacent areas or surfaces from damage as a result of the work of this Section.

3.2 APPLICATION

A. Installation of fire stopping materials shall be in exact accordance with the manufacturer's latest published instructions.

B. Installation shall be in accordance with the appropriate UL Building Materials Directory Assembly or with the appropriate Warnock Hersey International Listing.

C. Seal holes or voids made by penetrating items to ensure an effective fire and smoke barrier.

D. Seal all intersections and all penetrations of floors, ceilings, walls, and columns.

E. Seal around all cutouts for lights, cabinets pipes, and plumbing, HVAC ducts, electrical boxes, etc.

3.3 FIELD QUALITY CONTROL

A. Examine finished penetrations to ensure proper installation before concealing or enclosing any areas of work.

B. Keep areas of work accessible until inspection by applicable code authorities, and Architect.

C. Manufacturer's Field Service: Inspect to verify and confirm that systems installation is in strict conformance with manufacturer's and UL requirements. Report to Architect.

D. Correct unacceptable work and provide further inspection to verify compliance with requirements.

3.4 CLEANING

A. Immediately remove all spots, smears, stains, residues, adhesives, etc., from the Work of this Section and or upon adjacent areas or surfaces which result from the Work of this Section.

B. Upon the completion of the Work of this Section, dispose of (away from site) all debris, trash containers, residue, remnants and scraps which result from the Work of this Section.

C. Cleaning to be free of volatile solvents. Leave work area in a clean and satisfactory condition.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 This Section includes exterior building and site work sealants.
   02 Sealants for moving joints.
   03 Interior sealants and caulking.
   04 Provide foam backer rods where shown or required for proper installation of sealant types.

C. Related Work:
   01 Section 08 80 00 – Glazing
   02 Section 32 13 13 – Concrete Paving and Flatwork

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 If products from an acceptable manufacturer are being submitted, specifically cross reference the proposed products to the listed as the basis of design products.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

G. On-site sample for Architect's approval of colors.

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM International:
   01 ASTM C510 – Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   02 ASTM C661 – Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by Means of a Durometer.
   03 ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
   04 ASTM C794 – Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   05 ASTM C834 – Specification for Latex Sealants.
   06 ASTM C920 – Specification for Elastomeric Joint Sealants.
   07 ASTM C1087 – Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
   08 ASTM C1193 – Guide for Use of Joint Sealants.
   09 ASTM C1247 – Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
   10 ASTM C1248 – Test Method for Staining of Porous Substrate by Joint Sealants.
   11 ASTM C1311 – Specification for Solvent Release Sealants.
   12 ASTM C1330 – Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
   13 ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
   14 ASTM D624 – Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   15 ASTM D2203 – Standard Test Method for Staining from Sealants.
   16 ASTM D2240 – Test Method for Rubber Property - Durometer Hardness.

B. NSF International:
   01 NSF Standard 51 – Food Equipment Materials.

C. U.S. Food and Drug Administration (FDA):
   01 21 CFR 177.2600 - Title 21 Part 177 Indirect Food Additives: Polymers

1.4 WARRANTY

A. Warrant the Work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials or workmanship.

B. Warrant exterior joints against failure of the joint to effectively seal out water or moisture. Warrant interior joints against cracking, crazing separation of the material from the substrate or other joint failure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on products manufactured by Tremco.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Dow Chemical Co.
   02 Pecora, Inc.
   03 Sonneborn
   04 Manufacturers of products bearing the Thiokol Corporation seal of approval. All polysulfide sealants shall bear the seal.

2.2 MATERIALS

A. Caulking for exposed non-working interior locations at all hollow metal frames and abutting surfaces at ceiling, wall angles and all other locations for finished appearance:
   01 Type: Tremco “THC-901”.
   02 A multi-component, polyurethane sealant providing a fast-setting pliable seal with minimal shrinkage.

B. Exterior concrete horizontal joints, including drives, parking, sidewalks, play surfaces and other flatwork:
   01 Type: Tremco Vulkem 45SSL.
   02 High performance multi-component, chemically curing polyurethane sealant.

C. Exterior highly active joints in walls, masonry or concrete fences:
   01 Type: Tremco Dymeric.
   02 Gun grade, general purpose multi-component, chemically curing polyurethane sealant.

D. Exterior joints around windows, glazing, entrances, soffit joints and other general sealant areas:
   01 Tremco Spectrem 2.
   02 Medium-modulus, one-part, high performance, neutral-cure silicone sealant.

E. Exterior joints of concrete tilt-wall panels.
   01 Tremco Dymonic 100.
   02 High performance, medium-modulus, low VOC, UV-stable, non-sagging polyurethane sealant.

F. Interior Expansion Contraction or Control Joints where movement is to be accommodated: Tremco “Mono”.
   01 Tremco Spectrem 2.
   02 Medium-modulus, one-part, high performance, neutral-cure silicone sealant.

G. Interior General Purpose:
   01 Tremco Tremflex 834.
   02 High performance, one-part acrylic latex sealant.

H. Primers, Cleaners, Top Coats: Use only materials listed as suitable in resistance to staining, compatibility and durability before proceeding.

I. Back-Up Filler: Closed cell or open cell, non-gassing filler as recommended by sealant manufacturer.

J. Sealant colors shall be as selected by the Architect from manufacturer's full range of color selections.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine all assemblies to receive sealant and verify all Work is complete as required for the proper installation of sealant.

B. Do not accept joints that are wider than joint width limitations of the sealant to be used.

C. Notify Contractor of any irregularities and / or discrepancies and do not proceed until fully resolved.

3.2 APPLICATION

A. Temperatures: Do not install sealants when air temperature is under 40°F. Sealants may be warmed to ease installation when recommended by the manufacturer.

B. Tooling:
   01 Tool exposed joints to a slightly concave surface using slicking materials recommended by the manufacturer.
   02 The tooling procedure shall press sealant against the sides of the groove.
   03 No materials shall be left "feathered" out or smeared on the abutting materials.
   04 If necessary, protect adjacent surfaces with tape.
   05 Completed joints shall have a uniform professional appearance.
   06 Use an anti-tack compound on sealant that does not set up fast enough to avoid dust collection.

C. Sealant Back-Up: Provide a back-up filler where groove depth is too great to fill with sealant. Review joint design with Architect.

D. Compressive Filler: Seal vertical expansion joints with fillers. Provide compressible filler twice the width of the joint and with a depth of one and one-half times the compressed width. Lap ends a minimum of 2 inches.

E. Seal ends together in such a manner to allow natural drainage.
   01 Install filler by compressing material and sliding into joint.
   02 Align filler on one face of the joint before it expands to the full joint width.

3.3 CLEAN-UP

A. Immediately following installation of sealants, remove all excess sealant as required to result in clean sealant lines and applications.

B. Protect sealant installations as required until sealant has reached final set.

END OF SECTION

SECTION 07 95 00

EXPANSION JOINT COVERS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: Provide expansion joint covers as indicated on the Drawings, including, but limited to:
   01 Floor to floor conditions
   02 Floor to wall conditions
   03 Interior wall to wall conditions
   04 Exterior wall to wall conditions.
   05 Roof expansion joints are specified in Section 07 72 00 – Roofing and / or Section 07 62 13 – Sheet Metal Flashing.

C. Related Work:
   01 Section 05 50 00 – Metal Fabrications
   02 Section 07 54 19 – Thermoplastic Membrane Roofing
   03 Section 07 62 00 – Steel Metal Flashing
   04 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies in actual conditions within the Work of this Project.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
01 Provide two (2) samples of each finish for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 6” in length, but must be large enough to convey attributes of the proposed product.
04 Provide sample of the proposed assembly(s); 6” minimum length.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM International (ASTM):
01 ASTM A240 / A240-M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
02 ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
03 ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
04 ASTM C510 – Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants
05 ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
06 ASTM D2240 – Standard Test Method for Rubber Property—Durometer Hardness.
07 ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
08 ASTM E1399 – Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.

B. American Architectural Manufacturers Association (AAMA):
01 AAMA 611, Class II Anodic Aluminum Finishes

C. National Association of Architectural Metal Manufacturers (NAAMM):
01 Metal Finishes Manual for Architectural and Metal Products.

1.4 WARRANTY

A. All expansion joint covers shall be covered by manufacturer’s five (5) year warranty against manufacturer’s defects and becoming unserviceable for the intended purpose.

PART 2 - PRODUCTS

2.1 INTERIOR EXPANSION JOINT COVERS

A. Design of interior expansion joint covers is based on products manufactured by C-S Group.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Emseal
   02 Inpro Corporation
   03 Nystrom

C. General Materials:
   01 Aluminum: ASTM B 221, Alloy 6063-T5, 6063-T6, 6063-T52, 6061-T5, 6061-T6, 6061-T51, 6105-T5, 6105-T6, 6005-T5, 6005A-T5, 6005A-T61 for extrusions; ASTM B 209, Alloy 6061-T6, 3003-H14, 5005-H34 for sheet and plate.
   02 Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
   03 Clear Anodized Finish: Class II, Clear Anodic Finish: AA-M12C22A31 complying with AAMA 611.
   04 Bronze Anodized Finish: Class II, Color Anodic Finish: AA-M12C22A32/A34 (complying with AAMA 611.
   05 Stainless Steel Finish: ASTM A240A / A240M - Type 304 for plates, sheet, and strips.
      a. Finish: No.4, directional satin.
      b. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.
      c. Run grain with long dimension of each piece.
   06 Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.
   07 Compression Seals: ASTM D2000; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.
   08 Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.
      a. Provide at expansion joint covers at 2nd floor assemblies as required to maintain specified fire rating.
      b. Provide at expansion joint covers at rated partition assemblies as required to maintain specified fire rating.

D. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated.
   01 While specified joint systems establish the function and aesthetic intent, it may be necessary for the manufacturer to modify the joint systems to accommodate the movement requirements as scheduled in the contract documents.
   02 Such modifications should be made without significant changes to the aesthetic or functional intent of the joint systems.
   03 Provide units with capability to accommodate variations in adjacent surfaces.

E. Design architectural joint systems for the following size and movement characteristics:
   01 Nominal Joint Width: 1”
   02 Maximum Joint Width: 1-1/4”
   03 Minimum Joint Width: 3/4".

F. Floor-To-Floor Expansion Joint Covers: Design is based on C-S Group model GFST series.
   01 Aluminum Extrusions: Type as recommended by the manufacturer, in compliance with ASTM B221.

02 Primary Seal: Dual durometer TPR gasket, 65 shore A, 90 Shore A, ASTM D2240.
03 Gasket color as selected by the Architect from manufacturer's full range of selections.

G. Floor-To-Wall Expansion Joint Covers; Design is based on C-S Group model GFSTW series.
01 Same properties as floor-to-floor expansion joint cover.

H. Wall-To-Wall Expansion Joint Covers: Design is based on C-S Group model FWF series.
01 Aluminum Extrusions: Type as recommended by the manufacturer, in compliance with ASTM B221.
02 Primary Seal: Dual durometer TPR gasket, 65 shore A, 90 Shore A, ASTM D2240.
03 Gasket color as selected by the Architect from manufacturer's full range of selections.

I. Gypsum Board Ceiling-To-Ceiling Expansion Joint Cover: Design is based on C-S Group model FWF series.

J. Above expansion joint covers installed in rated assemblies shall be the same model number with addition of manufacturer's materials required for a 1-hour or 2-hour fire rated assembly as indicated on the Drawings.

2.2 EXTERIOR EXPANSION JOINT COVERS

A. Design of exterior expansion joint covers is based on products manufactured by C-S Group.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
01 Emseal
02 Inpro Corporation
03 Nystrom
04 Tremco

C. Vertical Wall-To-Wall Expansion Joints at Masonry Veneer: Design is based on C-S Group model VF series.
01 A precompressed low-modulus silicone with an open-cell polyurethane foam infused with a water-based, non-drying acrylic dispersion.
02 Color as selected by the Architect from manufacturer's full range of color selections, minimum 12.
03 Durometer Hardness: ASTM C661, Shore AI, Silicone coating – not to exceed 15 pts (+/-5).
04 Weatherometer: ASTM C510, Xenon Arc Weatherometer 2000 hours – no visible deterioration.
05 Wind Loading: ASTM E330, 150 MPH wind equivalent, +/- 0.1 mm net deflection
06 Water Penetration: ASTM E331-00, No water penetration after consecutive 15-minute soak durations under pressures of: 500 ΔP(Pa), 65 mph equivalent wind driven rain; 1000 ΔP(Pa), 92 mph equivalent wind driven rain; 5000 ΔP(Pa), 205 mph equivalent wind driven rain.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate all trades as required for proper design, sizing and locations of interfacing work to accommodate expansion joint covers.
   01 Verify flooring type to be installed at floor-to-floor expansion joint covers; and shim as required to match flooring height within 1/16”.
   02 Coordinate with drywall trades as required to properly float drywall at wall-to-wall expansion joint covers.
   03 Coordinate with masonry trades as required to provide flush struck end joints at masonry to interface with exterior wall-to-wall expansion joint covers

B. Examine surfaces and interfacing Work where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Prepare substrates according to architectural joint system manufacturer's written instructions.

3.2 INSTALLATION

A. Install all expansion joint covers in strict accordance with manufacturer's printed instructions and final reviewed Shop Drawings.

B. Coordinate and furnish anchorages, Setting Drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all interior and exterior hollow metal frames, including interior glazed opening frames, where indicated or scheduled on the Drawings.
   02 Provide all interior and exterior hollow metal doors where indicated or scheduled on the Drawings.

C. Related Work:
   01 Section 01 22 00 – Unit Prices
   02 Section 04 20 00 – Unit Masonry
   03 Section 05 41 00 – Structural Metal Stud Framing
   04 Section 07 92 00 – Joint Sealants
   05 Section 08 14 23.16 – Plastic-Laminate-Faced Wood Doors
   06 Section 08 71 00 – Door Hardware
   07 Section 08 80 00 – Glazing
   08 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Show or schedule location, size, thickness, elevation, details of construction, location and extent of hardware blocking, fire rating and other pertinent data for each door required.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Finish Hardware Location: Hollow metal manufacturer shall obtain an approved hardware schedule, hardware templates and samples of physical hardware where necessary to ensure correct fitting and installation.

E. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

F. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

1.3 REFERENCES

A. ASTM International (ASTM):
   01 A240/A240M-15b – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   02 ASTM A366 – Steel, carbon, cold-rolled sheet, commercial quality.
   03 ASTM A526 – Steel sheet, zinc-coated (galvanized) by hot dip process, commercial quality.
   04 A653/A653M-15 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip.
   05 A1008/A1008M-15 – Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
   06 B209-14 – Aluminum and Aluminum-Alloy Sheet and Plate.
   07 B209M-14 – Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
   08 B221-14 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   09 B221M-13 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
   10 D3656/D3656M-13 – Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns.
   11 E90-09 – Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

B. National Association of Architectural Metal Manufacturers (NAAMM), AMP 500-06 - Metal Finishes Manual.

C. National Fire Protection Association (NFPA), NFPA 80-16 - Fire Doors and Other Opening Protectives.

D. UL LLC (UL):
   01 10C-09 – Positive Pressure Fire Tests of Door Assemblies.
   02 1784-15 – Air Leakage Tests of Door Assemblies and Other Opening Protectives.

E. American National Standards Institute:
   01 ANSI A151-1-1969 – Test Method for Standard Steel Doors.
   02 ANSI A250.11-2001 Recommended Erection Instructions for Steel Frames.

1.4 DELIVERY AND HANDLING

A. Deliver, store and handle hollow metal work in strict accordance with manufacture's recommendations to prevent damage, rust and deterioration.

B. Store materials in a covered, dry location and promptly clean and touch-up scratches or rust spots with a rust-inhibitive primer.

C. Doors shall have their wrappings or coverings removed upon delivery at the building site and shall be stored in a vertical position spaced by locking for air circulation.

D. Doors and frames shall be clearly identified with opening number as indicated on the Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hollow metal door and frame manufacturers shall be members of the National Association of Architectural Metal Manufacturers (NAAMM).

B. The following manufacturers are acceptable to provide hollow metal doors and frames subject to meeting all provisions and requirements of this Section of Specifications:
   01 American Door Products
   02 Ceco / United Dominion Industries
   03 Curries
   04 Door Pro Systems
   05 Pearland Industries
   06 Republic Doors and Frames
   07 Steelcraft

2.2 MATERIALS

A. Doors:
   01 Doors shall be custom made, of types and sizes shown on reviewed Shop Drawings, and shall be fully welded seamless construction with no visible seams or joints on faces or vertical edges.
   02 Minimum door thickness shall be 1 3/4 inches, unless specifically noted or shown differently.
   03 Doors shall be strong, rigid and neat in appearance, free from warp and buckle. Corner bends shall be true and straight and of minimum radius for gauge of metal used.
   04 Provide 22-gauge steel stiffeners spaced max. 6-inch O.C. and extending full height of door.
   05 Fill interior with foamed in place urethane. Use mineral filler as required for labeled doors.
   06 Door Face Gauges:
      a. Doors 36” wide or less shall be 16 gauge galvanized.
      b. Doors 37” wide or more shall be 14 gauge galvanized.
   07 Faces shall be joined at vertical edges of door by a continuous weld extending full height of door. Welds shall be ground, filled and dressed smooth to provide a smooth flush surface.
   08 Top and bottom edges of doors shall be closed with a continuous recessed steel channel not less than 16 gauge, extending full width of door and spot welded to both faces.
      a. Exterior doors shall have an additional flush closing channel at top and bottom edges.
      b. Openings shall be provided in the bottom closure channel at top and bottom edges.

c. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

09 Edge profile shall be provided on both vertical edges of door as follows:
a. Single-acting swing doors - beveled 1/8 inch in 2-inch.

10 Hardware Reinforcements:
a. Doors shall be mortised, reinforced, drilled and tapped at factory for fully templated hardware, in accord with the reviewed hardware schedule and template provided by Section 08 71 00 - Door Hardware. Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only.
b. Minimum gauges for hardware reinforcing plates shall be as follows:
1. Hinge & pivot reinforcements: 7 gauge.
2. Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge.
3. Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge.
4. Channel / U-reinforcing at door lights shall be minimum 20 gauge; continuous all sides.

11 Edge Clearances:
a. Between door and frame at head and jambs: 1/8 inch.
b. At door sills with no threshold, 5/8 to 3/4 inch above finished floor.
c. At door sills with threshold, as required to suit threshold.
d. Between meeting edges of double doors – 1/8 inch.

12 Door Lite Kits: Design is based on Curries Type 9 Window Molding; 20 gauge, galvannealed material; wrap-around configuration, secured with vandal-proof fasteners.

13 Door Louvers: Fabricate from minimum 20 gauge and galvannealed material; inverted “Y” blade, sight-proof type, unless otherwise shown. Louver frame shall be wrap-around type secured with vandal-proof fasteners.

B. Frames:

01 Frames for exterior openings shall be made of commercial cold rolled steel conforming to ASTM A366, and shall be galvanized after fabrication.

02 Frames for interior openings shall be a) commercial grade, cold-rolled steel conforming to ASTM A366 or b) commercial grade hot rolled and pickled steel conforming to ASTM A569.

03 Door Frame Gauges:
a. Exterior opening frames 48” wide or less shall be 14 gauge.
b. Exterior opening frames 49” wide or more shall be 12 gauge.
c. Interior opening frames 48” wide or less shall be 16 gauge.
d. Interior opening frames 49” wide or more shall be 14 gauge.

04 Window Frame Gauges:
a. Interior opening frames with jamb / vertical mullions width / spacing 72” wide or less, and 30 SF or less shall be 16 gauge.
b. Interior opening frames with jamb / vertical mullions width / spacing 73” wide or more, and greater than 30 SF shall be 14 gauge.

05 Frames shall be custom made, welded units with integral trim of sizes and shapes shown on Drawings and required for the specific intended use.
a. Door stops shall be nominal 5/8”.
b. Returns shall be 1/2".

06 Frames shall be strong and rigid, neat in appearance, square, true and free of defects, warp and buckle. Molded members shall be clean cut, straight and of uniform profile throughout their length.

07 Jamb depths and profile shall be as shown on Drawings and required for the specific intended use.

08 Corner joints shall have contact edges closed tight, with trim faces mitered and continuously welded, and stops butted. The use of gussets shall not be permitted.

09 Minimum depth of stops shall be 5/8 inch.

10 Frames for multiple openings shall have mullion and rail members which are closed tubular shapes having no visible seams or joints. Joints between faces of abutting members shall be securely welded and finished smooth.

11 Hardware Reinforcements: Frames shall be mortised, reinforced, drilled and tapped at factory for fully templated hardware in accordance with finish hardware schedule and templates provided by Section 08 71 00 – Door Hardware. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.

12 Minimum thickness of hardware reinforcing plates shall be as follows:
- a. Hinge and pivot reinforcements (1-1/4" x 10" minimum size): 7 gauge.
- b. Strike reinforcements: 12 gauge.
- c. Flush bolt reinforcements: 12 gauge.
- d. Closer reinforcements: 12 gauge.
- e. Reinforcements for surface-mounted hardware, hold-open arms, surface panic devices: 12 gauge.

13 Floor anchors shall be securely welded inside each jamb, with holes for floor anchorage.

14 Jamb Anchors for frames for installation in masonry walls shall be provided with adjustable jamb anchors of the T-Strap type. Anchors shall be not less than 16-gauge steel. The number of anchors provided at each jamb shall be as follows:
- a. Frames up to 7'-6" height - 3 anchors.
- b. Frames 7'-6" to 8'-0" height - 4 anchors.
- c. Frames over 8'-0" height - 1 anchor for each 2 feet, or fraction thereof in height.

15 Jamb Anchors for frames for installation in wood or metal stud partitions shall be provided with steel anchors of suitable approved design, not less than 16-gauge thickness, securely welded inside each jamb as follows:
- a. Frames up to 7'-6" height - 4 anchors.
- b. Frames 7'-6" to 8'-0" height - 5 anchors.
- c. Frames over 8'-0" height - Four anchors plus one additional for each 2 feet, or fraction thereof over 8’-0”.

16 Jamb Anchors for frames to be anchored to previously placed concrete, masonry or structural steel shall be provided with anchors of suitable design as shown on reviewed shop drawings.

17 Dust cover boxes of not less than 26-gauge steel shall be provided at all mortised hardware items.

18 Frames shall be provided with steel spreader temporarily attached to bottoms of both jambs for bracing during shipping and handling.

19 Glass stops for interior glazed frames shall be loose stops, not less than 18-gauge steel, 1/2" x 1/2", with butt corner joints, secured to frame opening by countersunk tamper proof screws. Snap-on attachments will not be acceptable.

20 Prepare frame for silencers. Provide three single silencers for single doors on strike side. Provide two single silencers on frame head at double doors without mullions.

C. Finish: Shop paint steel (whether galvanized or ungalvanized) stops and accessories as follows:

01 Clean surfaces free of mill scale, rust, oil, grease, dirt and other foreign matter.

02 Chemically treat surfaces and apply one coat of an approved baked-on rust-inhibitive primer paint to provide a minimum 0.5 mil dry film thickness.

03 Frames at exterior openings shall be coated on the inside of the frame with a commercial grade, water-based mastic compound (or other approved coating material) prior to installation; 20 mil minimum coating / coverage.

D. Labeled Doors and Frames:
   01 Labeled doors and frames shall be provided for openings requiring fire protection ratings as scheduled. Such doors and frames shall be constructed as tested and approved by Underwriters Laboratories or other nationally recognized testing agency having a factory inspection service.
   02 If any door or frame scheduled to be fire rated cannot qualify for appropriate labeling because of its size, design, hardware or other reason; the Architect shall be so advised before fabrication work on that item is started.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separate dissimilar metals, protect against galvanic action.

B. Frames:
   01 Anchorage and Connections: Firmly anchor and secure to adjacent construction in strict accordance with manufacturer's Shop Drawings and installation instructions.
   02 Frame Spreader Bars: Leave intact until frames are set permanently square and plumb and frame anchors are securely attached.
   03 Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed.
   04 Installation of labeled frames shall conform to National Fire Protection Association Pamphlet No. 80, "Fire Door and Windows" and UL design requirements.
   05 At exterior locations, coat interior of frame with mastic or other approved coating material prior to installation; minimum 20 mil thickness.

C. Doors:
   01 Hang doors square, plumb and straight, firmly anchored into position. Eliminate hinge bound conditions and making all items smooth operating. Adjust operable parts for correct functions.
   02 Apply hardware in accordance with hardware manufacturer's templates and instructions.
   03 Remove hardware, with the exception of prime-coated items, tag box, and reinstall after finish paint work is completed.
   04 Installation of labeled doors shall conform to National Fire Protection Association Pamphlet No. 80, "Fire Doors and Windows" and UL design requirements.

D. Coordinate with other trades as required for installation of glass and glazing to be installed in doors and frames.

E. Immediately after erection, sand smooth all rusted and damaged areas of prime coat and apply touch-up with compatible air-drying primer.

END OF SECTION

SECTION 08 14 23.16

PLASTIC LAMINATE FACED WOOD DOORS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide solid core, plastic laminate faced, wood doors in sizes and styles as indicated and scheduled on the Drawings.

C. Related Work:
   01 Section 08 11 13 – Hollow Metal Doors and Frames
   02 Section 08 71 00 – Door Hardware
   03 Section 08 80 00 – Glazing

1.2 SUBMITSTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Show or schedule location, size, thickness, elevation, details of construction, location and extent of hardware blocking, fire rating and other pertinent data for each door required.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each plastic laminate finish for selection by the Architect.

02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Provide a copy of the lifetime warranty to be issued for contract close-out.

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM International:
01 ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
02 ASTM E413 – Classification for Rating Sound Insulation.

B. American National Standards Institute (ANSI), ANSI A208.1 – Particleboard.

C. American Woodworking Institute (AWI), AWI/AWMAC/WI Architectural Woodwork Standards, Section 9 – Doors.

D. Wood Door Manufacturer’s Association (WDMA):
01 WDMA I.S.1-A – Architectural Wood Flush Doors.
02 WDMA I.S. 10 – Industry Standard for Testing Cellulosic Composite Materials for Use in Fenestration Products.

E. National Fire Protection Association (NFPA):
01 NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
02 NFPA 252 – Standard Methods of Testing pf Door Assemblies.

F. Underwriters Laboratories:
01 UL 10-C – Standard for Positive Pressure Fire Tests of Door Assemblies.
02 UL Label Fire Door; All fire rated doors shall bear a UL identification on the hinge stile.

1.4 QUALITY ASSURANCE

A. High pressure decorative laminate faced doors shall conform to the latest edition of the following standards:
01 WDMA I.S. 1-A.
02 AWI Standards and requirements for “Premium Grade”.

B. Tolerances for warp, telegraphing, squareness, and pre-fitting dimensions as per the latest edition of WDMA I.S. 1-A.

C. Identifying Label: Each door shall bear identifying label indicating:
01 Door manufacturer.
02 Order number.
03 Door number.
04 Fire rating, if applicable.

D. Environmental Responsibility: Provide doors manufactured with the following environmentally responsible components:
01 Core: Particle Board; no added urea-formaldehyde.

02 Composite Crossband: High-Density Fiberboard (HDF); no added urea-formaldehyde.
03 Stiles and Rails: Structural Composite Lumber (SCL); no added urea-formaldehyde.

E. Where fire rated doors are required, provide labeled doors. Construction details and hardware application shall be as approved by the labeling agency.

F. Doors larger than 3’-0” wide x 7’-0” high shall require Owner approval prior to proceeding.

G. Thoroughly coordinate with other trades and / or suppliers as required to provide doors properly prepped for the specific installation.

1.5 WARRANTY

A. All doors shall be warranted for the life of the door under normal use against material defects, warping, and delamination of laminate facing and becoming unserviceable.

B. Any defects noted during the warranty period shall be corrected at no cost to the Building Owner. Such corrective work shall include all labor and material for repair, replacement, refinishing and re-hanging as required.

C. Provide Manufacturer’s executed, written lifetime warranty with close-out documentation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Plastic Laminate Faced Doors is based on products manufactured by VT Industries.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide plastic laminate clad doors provided proposed products meet or exceed all specified requirements:
01 Alfab, Inc.
02 Graham Manufacturing Co.
03 Marlite
04 Marshfield Door Systems
05 Mengel Wood Industries, Inc.
06 Ragland Manufacturing Co.

C. Plastic Laminate: The following manufacturers are acceptable to provide plastic laminate:
01 Ralph Wilson Plastics, "Wilsonart".
02 Formica Corp., "Formica".

2.2 MATERIALS - DOORS

A. Design of solid-core plastic laminate clad doors is based on VT Industries Heritage Collection series 303H doors.

B. All doors shall be 1-3/4” thick.

C. Core Material:
01 Core Material: Particle Board Core for non-rated and 20-minute fire-rated doors; mineral for 1-1/2 hour-rated doors.

02 Density: minimum 28-32 PCF. Comply with particleboard standard ANSI A208.1, Grade 1-LD-2.
03 Composite Crossband.

D. Door Stiles:
01 Door Stiles: minimum 1-3/8” (nominal) Structural Composite Lumber (SCL) bonded to core with minimum 1/16” hardwood veneer suitable for staining or painting to approximate plastic laminate finish as selected by the Architect.
02 Vertical door edges shall be factory painted / stained to match door face. Factory shall supply matching paint / stain and edges shall be touched-up in field.
03 Plastic laminate stiles shall not be acceptable.

E. Door Rails:
01 Door Rail: minimum 1-3/8” (nominal) Structural Composite Lumber (SCL).
02 Minimum 6” head rail at all doors to receive a closer.
03 Seal top, bottom and cut surface of openings at factory with two coats of varnish.
04 Where head rail may be visible from a second story vantage point, head rail shall be stained or painted to match stiles.
05 Glass Lite Frames / Stops: Metal type with painted finish. Coordinate with other trades as required.

2.3 MATERIALS – PLASTIC AMINATE

A. Horizontal grade, 0.048” minimum thickness.

B. Finish shall be as selected by the Architect from manufacturer’s full range of colors and finishes.

C. Laminate shall be applied to the core by a hot press method using Type 1 exterior grade, water resistant adhesive.

2.4 DOOR LITE FRAMES

A. Design of door lite framing for glass inserts is based on National Guard Products (NGP) model L-FRA100 Low Profile Lite Kit.
01 Other manufacturers shall be considered provide proposed products meet or exceed all specified requirements.
02 Provide in sizes as indicated on the Drawings.
03 Suitable for 1/4" glazing.

B. Design of door lite framing for louver inserts is based on National Guard Products (NGP) model L-FRA100-SP Low Profile Lite Kit for Variable Insert Thickness.
01 Other manufacturers shall be considered provide proposed products meet or exceed all specified requirements.
02 Provide in sizes as indicated on the Drawings.
03 Suitable for 1/4" glazing.

C. Fabricated from minimum 18 gauge cold rolled steel.

D. Welded construction with mitered corners.

E. One-sided countersunk screw mounting.

F. Provide with gray primed powder coat finish; to be field painted in color as selected by the Architect.

2.5 FABRICATION

A. Stile Edges: Apply hardwood edges before application of face laminates.

B. Prefit Doors:
   01 Prefit and bevel doors at factory to fit openings.
   02 Prefit Tolerances: WDMA I.S.1-A.

C. Factory-machine doors for mortised hardware, including pilot holes for hinge screws and lock fronts required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine locations to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.

B. Ensure frames are solidly anchored, allowing no deflection when doors are installed.

C. Ensure frames are plumb, level, square, and within tolerance.

D. Allow doors to become acclimated to building temperature and relative humidity for a minimum of 24 hours before installation.

3.2 INSTALLATION

A. Carefully verify that doors are properly installed at intended door location and that door prep for finish hardware is accurate and complete.

B. Install all doors plumb and square to frame with +/- 1/8” clearance between door and frame.

C. Install finish hardware in accordance with approved templates.

D. Verify that top and bottom rails are sealed prior to door installation.

E. Take all necessary precautions to protect door finishes before, during and after installation. In the event of damage to the plastic laminate surfacing, replace door.

F. Do not strip heads of Phillips head screws. Remove and replace all stripped screws.

G. Upon completion of door installation, cycle door several times to confirm that door, frame and hardware are all installed and functioning correctly.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Access flush access doors where indicated on the Drawings.
   02 Access flush access doors at all plumbing chases. Coordinate locations with Architect.
   03 Provide flush access doors in horizontal gyp board and / or plaster ceilings or soffits as indicated on the Drawings.
   04 Where access doors are installed in a rated partition or assembly, provide fire-rated access doors.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 09 21 16 – Gypsum Board Assemblies
   03 Divisions 22 and 23 – Access doors for plumbing and mechanical items.
   04 Division 26 – Access doors for electrical items

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies. Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of access doors is based on products manufactured by Milcor, Inc.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed all specified requirements.
   01 Acudor Products Inc.
   02 The Bilco Company
   03 Ruskin Company

2.2 MATERIALS

A. Design of access doors is based on Milcor:
   01 Series M Architectural Access Door for non-fire-rated assemblies.
   02 Series UFR Universal Fire Rated Access Door for rated assemblies.

2.3 ACCESS DOORS – NON-FIRE-RATED

A. Design of non-fire-rated access doors is based on Milcor Series M Architectural Access Door.

B. Door: 16-gauge, cold rolled steel.

C. Frame: 16 gauge. cold rolled steel. Frame to be provided with pre-formed mounting holes 3/16“ diameter at 4” spacing. Inner frame included to allow latching.
   01 Provide cadmium plated or stainless-steel screws as appropriate for wall substrate.

D. Hinge: Concealed spring hinges open to 175 degrees for complete access without allowing the door to impact the wall. Quantity varies per door panel size. Extracting pin from hinge leaf attached to panel permits panel removal.

E. Latch: Cylinder lock (replaces one cam latch) furnished with two keys. Additional custom options available upon request.

F. Finish: Powder coat colors - Grey, Gold Sand, Jet Black as selected by the Architect.

G. Sizes: Unless otherwise indicated on the Drawings, provide the following:
   01 Single User Restrooms: 18” x 18”.
   02 Multi User Restrooms: 22” x 30”.
   03 Gypsum Board Ceilings: 24” x 24”.
   04 Plaster Ceilings and Soffits: 24” x 24”.

2.4 ACCESS DOORS – FIRE-RATED

A. Design of non-fire-rated access doors is based on Milcor Series UFR Universal Fire Rated Access Door.

B. Door: 20-gauge, cold rolled steel sandwich panel with 2” mineral fiber insulation.

C. Frame: 16 gauge 4-piece cold rolled steel with masonry anchors.

D. Hinge: 18-gauge continuous piano hinge with stainless steel pin.

E. Closer: Coil spring self-closing.

F. Latch: Self-latching paddle latch and locking system with key operated cylinder lock furnished with two keys and interior release mechanism; (1) per door for sizes below 36”; (2) per door for sizes 36” - 48”.

G. Rating:
01 Rating is maintained for a two-hour wall.
02 Carries UL and CUL 1½ -hour, Class B fire rating.
03 Warnock Hersey Label for three-hour noncombustible ceiling systems.
04 UL Certified: 250°F temperature rise protection for cold rolled steel; 450°F temperature rise protection for stainless steel.

H. Finish: Powder coat colors - Grey, Gold Sand, Jet Black as selected by the Architect.

I. Sizes: Unless otherwise indicated on the Drawings, provide the following:
01 Single User Restrooms: 18” x 18”.
02 Multi User Restrooms: 22” x 30”.
03 Gypsum Board Ceilings: 24” x 24”.
04 Plaster Ceilings and Soffits: 24” x 24”.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate locations with the trade that is constructing the material being penetrated.

B. Verify by comparing packing slip and box label that product is per Specification.

C. Verify that the substrate is dry, clean, and free of foreign matter and in compliance with requirements for installation tolerances and other conditions affecting performance. Report and correct any defects prior to any installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Refer to manufacturer’s product literature for surface preparation requirements.
01 Surfaces should be structurally sound, free of voids, spalls, loose aggregate and sharp ridges. Remove dust, dirt, debris or any other foreign materials.

3.2 INSTALLATION

A. Install access doors in strict accordance with manufacturer’s instructions and approved submittals.

B. Take all necessary precautions to protect adjacent work and finishes. Coordinate with other trades to repair finishes and other damaged during installation.

C. Test units for proper function and adjust until proper operation is achieved.

D. Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

A. Remove and replace access doors with damage, bowing, or warping that interferes with the installation or functionality of product.

B. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

C. Protect completed work from subsequent construction activities as recommended by manufacturer.

END OF SECTION

SECTION 08 33 13

COILING COUNTER DOORS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide manually operated, non-fire-rated overhead coiling counter doors where indicated or scheduled on the Drawings.
   01 Assemblies shall be complete, including guides, hoods, operator, weather seals, hardware and accessories.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 08 71 00 – Door hardware
   03 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals:
01 Provide complete operations and maintenance manuals to the Owner.
02 Refer to section 01 78 23 – Operations and Maintenance Manuals
03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM International (ASTM):
01 ASTM A480/A480M – Standard Specification for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
02 ASTM A653/A653M – Standard Specification for Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
03 ASTM A666 – Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
04 STM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
05 ASTM B209 – Standard Specification for Aluminum - Alloy Sheet and Plate.
06 ASTM B221 – Standard Specification for Aluminum - Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

B. National Fire Protection Association (NFPA) - 80 – Standard for Fire Doors and Fire Windows.

C. Underwriters Laboratories (UL) 10B - Standard for Fire Tests of Door Assemblies.

1.4 QUALITY ASSURANCE

A. Company specializing in the manufacturing of products specified in this Section and with a minimum of five (5) years of experience.

B. Installer Qualifications: Installer shall be authorized and qualified to install overhead door systems on the type and scope of project specified.

C. Source Limitations: Provide overhead coiling doors from one manufacturer for each type of door. Provide operators and other accessories from source acceptable to overhead coiling door manufacturer.

D. Performance Requirements:
01 Fire Door Construction: Conform to UL 10B
02 Installed Fire Door Assembly: Conform to NFPA 80

1.5 WARRANTY

A. Standard Warranty: Four (4) years from ~~date of shipment~~ Substantial Completion against defects in material, operation and workmanship.

B. Maintenance: Submit for owner’s consideration and acceptance of a maintenance service agreement for installed products. Option to implement maintenance agreement lies solely

with the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on coiling counter door products provided by Overhead Door Co.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section, provided proposed products meet or exceed all specified requirements.
   01 Overhead Door Corporation
   02 Atlas Door Corporation / Cornell Iron Works
   03 Cookson
   04 Cornell
   05 C.H.I. Overhead Doors

2.2 MATERIALS

A. Stainless Steel Sheet:
   01 ASTM A480/A480M or ASTM A666 – Type 304 or 316, roll form temper.

B. Aluminum:
   01 Extrusions: ASTM B221, alloy and temper best suited to application.
   02 Sheet: ASTM B209, alloy and temper best suited to application.

2.3 OVERHEAD COILING COUNTER DOORS – NON-FIRE-RATED

A. Manufacturers Overhead coiling counter door design is based assemblies / systems manufactured by Overhead Door Company.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this section, provided all proposed products meet or exceed the specified requirements.
   01 Overhead Door Corporation
   02 Cookson Door
   03 Cornell Iron Works
   04 Alumintec Pacific Products

C. Design of non-fire-rated coiling counter doors is based on Overhead Door Co. Series 651 Counter Doors with hood as manufactured by Overhead Door Corporation or equivalent by one of the acceptable manufacturers listed above.

D. Construction:
   01 Wall Mounting Condition: Face-of-wall mounting
   02 Curtain:
      a. Interlocking slats
      b. Interlocking roll-formed clear anodized aluminum slats with endlock for curtain alignment. Slats, 0.040 inch (1 mm) thick, and extruded aluminum bottom bar with neoprene astragal.
      c. Endlocks attached to alternate slats to maintain curtain alignment and prevent lateral slat movement.
   03 Integral Frame and Sill: Integral stainless steel frame and sill with a #4 finish. Frame consists of 16 gauge jambs and header, with 14 gauge sill.
   04 Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel,

supporting the curtain with deflection limited to 0.03 inch (0.8 mm) per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.

05 Hood: Stainless steel with a #4 finish and provided with intermediate support brackets as required.

E. Operation: Crank Operation

F. Locking: Slide bolt on bottom bar at jambs

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrates, areas, and conditions for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

D. Coordinate with Electrical and Fire Alarm Contractors as required for proper rough-in and final connections required for a fully functional assembly.

3.2 INSTALLATION

A. Install in strict accordance with manufacturer's printed instructions and recommendations at locations shown on Drawings.

B. Anchor to adjacent construction without distortion or stress.

C. Fit and align door and shutter assembly including hardware, plumb, level and square to ensure smooth operation.

D. Adjust all moving parts so that doors operate smoothly throughout full operating range.

E. Adjust seals to provide a tight fit around the entire perimeter.

F. Install per NFPA 80.

3.3 CLEANING

A. Thoroughly clean surfaces and entire assembly prior to Owner acceptance.

3.4 DEMONSTRATION

A. Prior to Owner demonstration, submit and receive approval of operation and maintenance manuals required in Section 01 77 00 – Close-Out Procedures. Provide O&M manuals to Owner prior to conducting Owner demonstration.

B. Demonstrate proper operation to Owner's Representative.

C. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 08 43 29

SLIDING STOREFRONTS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Interior aluminum sliding door framing system

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 07 95 00 – Joint Sealants
   03 Section 08 71 00 – Finish Hardware
   04 Section 08 80 00 – Glazing
   05 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Samples:
   01 Submit samples indicating quality of finish on alloys used for work, 12 inch lengths.
   02 Where normal color and texture variations are expected, include additional samples to show range of such variations.

1.3 REFERENCES

A. Quality Standard: Comply with the Aluminum Extrusion Manual and the Alcoa Anodic Finish Description.

B. Labeled Assemblies:
   01 Where fire-rated door and frame assemblies are required, provide assemblies which comply with NFPA 80 and have been tested and labeled in accordance with ASTM E152.
   02 All frames shall have UL label affixed to frame.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating sliding storefronts that meet or exceed performance requirements indicated and of documenting this performance by including of test reports and calculations.

C. Source limitations: Obtain sliding storefront through one source from a single manufacturer.

1.5 PROJECT CONDITIONS / SITE CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrications; show recorded measurements on shop drawings.

1.6 WARRANTY

A. Material and Workmanship: Submit manufacturer's and installer's written warranty agreeing to repair or replace system which fails in materials or workmanship with two (2) years of the date of substantial completion.
   01 Failure of the product shall include excessive deflection, deterioration of finish on metal, glass breakage due to defective design, defects in accessories and other components of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of interior sliding storefront systems are based on products manufactured by Record-USA, Inc., Monroe, NC (704) 289-9212

2.2 MATERIALS

A. Interior sliding storefront systems are based on Record Door 5900 series Sliding ICU/CCU manual sliding door system.
   01 Single track.
   02 Aluminum extrusions to comply with ASTM B221, 6063-T5 aluminum alloy.
   03 Finish to be clear anodized, conforming with ASTM B209 and AAMA 607.1, Architectural Class 1, 0.7 mil thickness.

04 Frame: 1-3/4" x 4-1/2", center glazed to accept ¼" clear, tempered glass, or glass as specified and scheduled for opening.

B. Provide fasteners, anchors, clips and accessories, locking and trim hardware as recommended by manufacturer for a complete installation. Do not use thumbturns. Cylinders to accept "Best" core. Coordinate with 08 71 00 – door hardware …

C. Sliding door configurations are both bi-parting and slide to one side. Refer to drawings for configuration and coordinate with adjacent glazing and or wall systems as required for a complete finished product and systems.

D. Floor track to be SO-SX trackless no floor embed allowed.

E. Doors must secure or lock in the open or closed position for safety and to prevent unauthorized movement.

F. Bottom rail to comply with TAS regulations.

2.3 FABRICATION

A. Fabricate components per the manufacturer's most current installation instruction manuals with minimum suggested clearances and shim spacing around the perimeter of the assembly while enabling installation and dynamic movement of the perimeter seal.

B. Accurately fit and secure all joints and corners.

C. Prepare frames to receive anchor devices as required.

D. When possible, arrange fasteners and attachments to conceal from view.

E. Shop assemble frames to greatest extent possible and shop seal all horizontal to vertical joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural supports, anchorage, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operations clearances.

B. Verify that adjacent surfaces are dry, clean and free of mortar, dirt, grease, rust and other construction debris.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing sliding storefronts, hardware, accessories, and other components.

B. Install sliding strorefronts level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Separate aluminum from dissimilar materials to prevent corrosion or electrolytic action at points of contact.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating door panels, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing sliding storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean glazing after installing sliding storefronts. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

D. Protect sliding storefront surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor sliding storefront surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, mortar, alkaline deposits, stains or other contaminants. If contaminating substances do contact sliding strorefront surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

SECTION 08 56 19

INTERIOR TRANSACTION WINDOWS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide self-closing sliding transaction windows where indicated or scheduled on the Drawings.

C. Related Work:
   01 Section 08 11 13 – Hollow Metal Doors and Frames
   02 Section 08 71 00 – Door Hardware
   03 Section 08 80 00 – Glazing

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Operations and Maintenance Manuals
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   01 ANSI Z97.1 – American National Standard for Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

B. American Society for Testing and Materials (ASTM):
   01 ASTM A36 /A36M – Standard Specification for Carbon Structural Steel.
   02 ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   03 ASTM A653 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   04 ASTM A666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   05 ASTM B221 / B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   06 ASTM C1036 – Standard Specification for Flat Glass.
   07 ASTM C1048 – Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
   08 ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   09 ASTM D1929 – Standard Test Method for Determining Ignition Temperature of Plastics.
   10 ASTM E2188 – Standard Test Method for Insulating Glass Unit Performance.
   11 ASTM E2189 – Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
   12 ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.
   13 ASTM F588 – Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing.
   14 ASTM F2329 – Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.

C. American Architectural Manufacturers Association:
   01 AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.
   02 AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

D. American Society Mechanical Engineers Standards:
   01 ASME SA-240/SA-240M – Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.`

E. National Fire Protection Association (NFPA):
   01 NFPA 80 – Fire Doors and Windows.
   02 NFPA 252 – Fire Tests of Door Assemblies.
   03 NFPA 257 – Fire Tests of Window Assemblies.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Provide aluminum framing systems and windows from one source and supplied by a single manufacturer.

C. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in:
   01 Flat Glass Marketing Association:
      a. Glazing Sealing Systems Manual.
      b. Glazing Manual.

1.5 WARRANTY

A. Warranty the Work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to, the following:
   01 Operational issues that preclude smooth operation and functioning
   02 Noticeable deterioration of finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of special function windows is based on products manufactured by QuickServ Corp.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 C.R. Lawrence

2.2 PERFORMANCE SPECIFICATIONS

A. Requirements apply simultaneously through the most adverse conditions of each exterior application.
   01 Thermal Movement at Exterior Systems: Provide for noiseless expansion and contraction of all materials and assemblies due to temperature changes in a range between 10°F and 180°F, without detriment to appearance or performance.
   02 Water Infiltration at Exterior Systems: Drain water entering at joints and condensation occurring within the wall construction to the exterior face of the wall. Allow no uncontrolled water other than condensation on the interior face of the wall.
   03 Air Filtration at Exterior Locations: Limit air leakage to maximum 0.005 CFM/SF at 6.24 PSF.

2.3 GENERAL MATERIALS

A. Aluminum Extrusions: ASTM B221 / B221M. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength and not less than 0.125 inch thick at any location for main frame and sash members.

B. Steel Plates, Shapes, and Bars: ASTM A36 / A36M.

C. Metallic-Coated Steel Sheet:
   01 ASTM A653 / A653M – CS (Commercial Steel), Type B; with G90 (Z275) zinc (galvanized) coating designation.
   02 AMS5511 – steel, corrosion-resistant, sheet, strip, and plate, 19Cr - 9.5Ni (304L), solution heat treated.
   03 AMS5513 – steel, corrosion-resistant, sheet, strip, and plate 19cr 9.2Ni (SAE 30304) solution heat treated.

D. Stainless Steel Sheet, Strip, Plate, and Flat Bars:
   01 ASTM A666 – austenitic stainless steel, Type 304, stretcher-leveled standard of flatness.
   02 ASME SA-240/SA-240M – chromium and chromium-nickel stainless steel plate, sheet, and strip for general applications.

E. Concealed Bolts: ASTM A307 – Grade A unless otherwise indicated.

F. Embedded Plate Anchors: Fabricated from steel shapes and plates, minimum 3/16 inch (4.8 mm) thick; with minimum 1/2-inch- (12.7-mm-) diameter, headed studs welded to back of plate.

G. Welding Rods and Bare Electrodes: Select according to AWS Specifications for metal alloy welded.

H. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement.
   01 Sealant shall remain permanently elastic, non-shrinking, and non-migrating.

I. Gaskets: For gaskets required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Gaskets shall remain permanently elastic, non-shrinking, and non-migrating.

J. Inserts and Anchorage Devices:
   01 Manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars or tubes.
   02 Provide all anchoring angles, plates, fasteners and accessories required for secure attachment to adjacent Work.

K. Fasteners:
   01 Non-magnetic stainless steel or cadmium plated steel coated with yellow or silver iridescence plating, compatible with materials being fastened.
   02 Provide series 300 stainless steel for exposed locations.
   03 Provide cadmium plated steel with 0.0005 inch plating thickness and color chromate coated for concealed locations.
   04 Provide concealed fasteners wherever possible.
   05 For exposed locations, provide countersunk flathead fasteners with finish matching item fastened.
   06 Finish of sub-sill flashing shall match frame finish.

L. Miscellaneous Materials:
   01 Provide material isolators at all dissimilar metals in contact with aluminum framing components.

2.4 SLIDING TRANSACTION WINDOW

A. Design of sliding transaction windows is based on QuickServ Self-Closing (SC) series manual sliding window.

B. Nominal Size:
   01 QuickServ Model SC-4030 (48”W x 36”H)
   02 Custom size as indicated on the Drawings.

C. Frames: Nominal 4-1/2” aluminum frame modules shall be constructed of 6063-T5 extruded aluminum.
   01 Replacement and servicing of glass shall be from the clerk side of the window by means of an access panel in the top header and does not require the removal of the frame from the opening.

D. Glass Type G-2: Fully Tempered Clear Glass:
   01 1/4" thick.
   02 Complying with ASTM C1048, Type 1, Class 1 (clear), Quality 3, Kind FT.
   03 Clear.

E. Operation:
   01 Self-closing with hold open feature
   02 Track System: Top-hung ball bearing system providing smooth operation of operable window.

F. Provide keyed lock.

G. Framing Finish: Clear Anodized.

PART 3 - EXECUTION

3.1 PREPARATION

A. Windows are designed to be mounted with a cased opening of a larger aluminum and glass window system.

B. Coordinate with glazing contractor as required to provide rough opening as required for proper installation of, and interface with transaction window; including anchoring of transaction window.

3.2 INSTALLATION

A. Install all transaction windows in strict accordance with the manufacturer’s installation standards and recommendations.

B. Upon completion of installation, thoroughly test all functions of the window to verify proper operation.

3.3 PROTECTION

A. Protect all windows during and after installation from marring, blemishes, scratches and damage due to incidental adjacent Work.

B. If damaged, make all necessary repairs or replacements in accordance with the manufacturer's recommendations and as directed by the Architect.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:

    a. Swinging doors.
    b. Gates.

2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 06 Section “Rough Carpentry”
3. Division 06 Section "Finish Carpentry”
4. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

    a. “Metal Doors and Frames”
    b. “Flush Wood Doors”
    c. “Stile and Rail Wood Doors”
    d. “Interior Aluminum Doors and Frames”
    e. "Aluminum-Framed Entrances and Storefronts"
    f. “Stainless Steel Doors and Frames”
    g. “Special Function Doors”
    h. "Entrances”

6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 “Electrical” sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 “Electronic Safety and Security” sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
2. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

    a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
    b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
    c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

    a. Wiring Diagrams: For power, signal, and control wiring and including:
        1) Details of interface of electrified door hardware and building safety and security systems.
        2) Schematic diagram of systems that interface with electrified door hardware.
        3) Point-to-point wiring.
        4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

    a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
    b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
    c. Indicate complete designations of each item required for each opening, include:
        1) Door Index: door number, heading number, and Architect's hardware set number.
        2) Quantity, type, style, function, size, and finish of each hardware item.
        3) Name and manufacturer of each item.
        4) Fastenings and other pertinent information.
        5) Location of each hardware set cross-referenced to indications on Drawings.
        6) Explanation of all abbreviations, symbols, and codes contained in schedule.
        7) Mounting locations for hardware.
        8) Door and frame sizes and materials.
        9) Degree of door swing and handing.
        10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
    f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
    g. Furnish End User with one copy of Best Access System "Keystone 600N5" key management software program.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Factory order acknowledgement numbers (for warranty and service)
    d. Name, address, and phone number of local representative for each manufacturer.
    e. Parts list for each product.
    f. Final approved hardware schedule edited to reflect conditions as-installed.
    g. Final keying schedule
    h. Copies of floor plans with keying nomenclature
    i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
    j. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

    a. Warehousing Facilities: In Project's vicinity.
    b. Scheduling Responsibility: Preparation of door hardware and keying schedules.
    c. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
    d. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
        1) Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with a minimum of three years experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. All technicians who will be working on site must be a licensed Locksmith thorough DPS and must present pocket card upon request.
4. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.

b. Can provide installation and technical data to Architect and other related subcontractors.
c. Can inspect and verify components are in working order upon completion of installation.
d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

5. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
b. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

a. Comply with governing accessibility regulations cited in “REFERENCES” article, herein for door hardware on doors in an accessible route.

C. Pre-Installation Meetings

1. Keying Conference

a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2) Preliminary key system schematic diagram.
3) Requirements for key control system.
4) Requirements for access control.
5) Address for delivery of keys.

2. Pre-installation Conference

a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

b. Inspect and discuss preparatory work performed by other trades.
c. Inspect and discuss electrical roughing-in for electrified door hardware.
d. Review sequence of operation for each type of electrified door hardware.
e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer’s original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer’s published listings.

a. Schlage
1) ND Series: 10 year mechanical
2) Electrified Lock: 1 year electrical

b. Von Duprin
1) Exit Device: 3 year mechanical
2) Electrified Exit Device: 1 year electrical

c. LCN
1) 4000 Series: 30 year mechanical

d. Ives
1) Continuous Hinges: Lifetime

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Use sex nuts (rather than thru-bolts) wherever feasible. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:

1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable per owner standards.
2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable per owner standards.
3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Ives 5BB series.

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

    a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
    b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

    a. Exterior: Continuous Hinges at all openings.
    b. Interior: As scheduled in HW Sets

4. 2 inches or thicker doors:

    a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
    b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height. Provide four hinges at doors over 36 inches.
6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins
    f. Dutch Doors: Four Hinges

8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.
12. Use through-wire hinge at interior openings, where applicable.
13. Door Loops are not permitted (unless specifically reviewed/approved by owner).

2.04 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:

    a. Scheduled Manufacturer: Ives.

2. Requirements:

    a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
    b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
    c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
    d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
    e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
    f. Provide aluminum geared continuous hinges with TWP electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
    g. Install hinges with fasteners supplied by manufacturer.
    h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.
2. Specify: (Trimco) Semi-Auto Flushbolt 3825L (WD) / 3820L (MD) X 3850-AT RATED (TOP ONLY) No Substitution.

2.06 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage ND series.
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.

5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

    a. Lever Design: Schlage Rhodes.

2.07 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 99/33A series.
2. Acceptable Manufacturers and Products: No Substitutions.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with “SNB” thru-bolts as specified in the hardware sets.
9. Provide Steel Sex-Nuts at rated doors.
10. Provide exit devices with manufacturer’s approved strikes.
11. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
12. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
13. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
14. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
15. Provide electrified options as scheduled.
16. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
17. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
18. Provide cylinder dogging with special indicator (CDSI) as specified at non fire-rated openings.
19. Provide (LD) “Less Dogging” at all exterior openings, unless scheduled otherwise. (ALL OPENINGS TO BE REVIEWED BY OWNER AT KEYING CONFERENCE, PRIOR TO ORDERING).
20. Provide storage kits only at designated openings, specified with keyed removable mullion. (ALL OPENINGS TO BE REVIEWED BY OWNER AT KEYING CONFERENCE, PRIOR TO ORDERING).

2.08 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Schlage SFIC rim or mortise housings as scheduled.
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide interchangeable cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide visual control on face of Best permanent Core.

C. Construction Keying:

1. Manufacturers: Best Replaceable Construction Cores (Provided by owner).
2. Acceptable Manufacturers and Products: No Substitution.

    a. Owner to provide Construction Cores, Change Key(s) and Control Key(s).
    b. Owner or Owner's Representative will replace temporary construction cores with permanent cores as furnished by subcontractor.

2.09 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

1. Manufacturers: Best (Match owner's existing system).
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system. Best (Match owner's existing system).

    a. Master Keying system as directed by the Owner.

2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features:

    a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    b. Patent Protection: Keys and blanks protected by one or more utility patent(s).

4. Identification:

    a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
    b. Identification stamping provisions must be approved by the Architect and Owner.
    c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

5. Quantity: Furnish in the following quantities.

a. Change (Day) Keys: 3 per cylinder/core.
b. Permanent Control Keys: 3.
c. Master Keys: 6.

2.10 KEY CABINETS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Telkee: www.telkee.com/#sle

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. Telkee.

2.11 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series.
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 5/8 inch (16 mm) diameter double heat-treated pinion journal.

4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Provide door closer devices with “SNB” as specified in Hardware Sets at exterior doors.
12. Provide door closers with “TBSRT” as specified in Hardware Sets.

2.12 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide push plates, push bars, pull plates, and pulls with diameter and length as scheduled.
2. Provide VR910 trim on all exterior doors with panic devices.

2.13 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers and Products: No Substitution.

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.14 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson.

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.15 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives, Trimco.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: Zero International, Trimco.

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Provide surface mount brush door sweep as scheduled.
3. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
5. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.17 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.
4. Install silencers after final frame painting.

2.18 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: N/A.

B. Requirements:

1. Furnished and installed by Division 28 contractor.

2.19 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

1. Do not proceed until unsatisfactory conditions have been corrected.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. All services provided shall be professional and conform to the highest standards for industry practices. The Owner reserves the right to halt any installation due to poor workmanship. All work shall be defect free, and the installer shall replace, at their expense, any work found to be defective.

B. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting. Paint entire door prior to installing hardware.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Install silencers after final frame painting.

J. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

K. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect's opening number.

L. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

M. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

N. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

1. Report findings in writing to architect and hardware supplier outlining corrective actions and recommendations.

3.03 FIELD QUALITY CONTROL

A. Engage qualified, independent, Door Hardware Institute (DHI) Certified, Fire Door Assembly Inspector (CFDAI) or Architectural Hardware Consultant (AHC) to perform inspections, prepare inspection reports, and issue inspection reports.

1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.
2. Representative will inspect fire rated doors and state in report whether installed work complies with NFPA 80.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction. After air balance tests are complete:

a. Check and adjust closers to ensure proper operation.
b. Adjust closer to complete full closing cycle in less than 4 to 6 seconds without abrupt change of speed between “Sweep” and “Latch” speeds.
c. Adjust “Backcheck” according to manufacturer’s instructions.
d. Set exterior door closers to have 8.5lb maximum pressure to open, interior non-rated at 5lbs, rated openings at 12 lbs.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

106568 OPT0278106 Version 5

Hardware Group No. 001.1 - OVERHEAD DOORS

For use on Door #(s):

Provide each RU door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
EA	ALL HW BY OTHERS			B/O

OVERHEAD DOORS

Hardware Group No. 002 - SLIDING DOORS (CYLINDER ONLY/BALANCE BY OTHERS)

For use on Door #(s):

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	SFIC CYLINDER	(TYPE/QTY AS REQD) QTY/TYPE REQD	626	SCH
1	EA	CONST. CORE	BY OWNER QTY/TYPE REQD		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	THUMBTURN	QTY/TYPE AS REQD		SCH
		NOTE	BALANCE OF HARDWARE BY DOOR Mfr DOOR CONTACT - WORK OF DIVISION 28		

-COORDINATE HARDWARE WITH DOOR MFR.
-REMOVE CYLINDER AND CORE IF NOT REQUIRED.

SLIDING DOORS (CYLINDER ONLY/BALANCE BY OTHERS)

Hardware Group No. 003 - CASED OPENING

For use on Door #(s):

Provide each CO door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	CASED OPNG	NO HARDWARE REQD		B/O

CASED OPENING

Hardware Group No. 101 - SGL OFFICE LOCK/CLOSER

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

SGL OFFICE LOCK/CLOSER

Hardware Group No. 101-CH - SGL OFFICE LOCK/CLOSER (COAT HOOK AT ADMIN AREA)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	COAT HOOK	3071	630	TRI

DELETE KP AT DOOR A124-1.

SGL OFFICE LOCK/CLOSER (COAT HOOK AT ADMIN AREA)

Hardware Group No. 103 - SGL OFFICE LOCK

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

SGL OFFICE LOCK

Hardware Group No. 103-CH - SGL OFFICE LOCK (COAT HOOK AT ADMIN AREA)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	COAT HOOK	3071	630	TRI

SGL OFFICE LOCK (COAT HOOK AT ADMIN AREA)

Hardware Group No. 200 - PR STOREROOM LOCK/CLOSER

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	SEMI-AUTO FLUSH BOLT	3825L (WD) / 3820L (MD) X 3850-AT RATED (TOP ONLY)	630	TRI
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	COORDINATOR	COR X FL BRKTS/SPACERS REQD 3780 AT OUTSWING	628	IVE
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT ACTIVE	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	SURF OVERLAPPING ASTRAGAL	7306A/7306B-A AS REQUIRED (HW CUTOUTS AS REQD)	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

-USE 3/4" LATCHBOLT AT FIRE RATED DOORS IF USING CYLINDRICAL LOCKSET

PR STOREROOM LOCK/CLOSER

Hardware Group No. 200C - PR STOREROOM LOCK/CLOSER/SCUSH

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	SEMI-AUTO FLUSH BOLT	3825L (WD) / 3820L (MD) X 3850-AT RATED (TOP ONLY)	630	TRI
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	COORDINATOR	3780	628	ABH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ INACTIVE LEAF	630	GLY
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ ACTIVE LEAF	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	SURF OVERLAPPING ASTRAGAL	7306A/7306B-A AS REQUIRED (HW CUTOUTS AS REQD)	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

-USE 3/4" LATCHBOLT AT FIRE RATED DOORS IF USING CYLINDRICAL LOCKSET

PR STOREROOM LOCK/CLOSER/SCUSH

Hardware Group No. 201 - SGL STOREROOM LOCK/CLOSER

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203 - SGL STOREROOM LOCK

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203W - SGL STOREROOM LOCK

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 212 - PR STOREROOM LOCK/OH STOP/HOLD

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	SEMI-AUTO FLUSH BOLT	3825L (WD) / 3820L (MD) X 3850-AT RATED (TOP ONLY)	630	TRI
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
2	EA	OH STOP & HOLDER	100H (SIZE/MNT REQD)	630	GLY
1	EA	SURF OVERLAPPING ASTRAGAL	7306A/7306B-A AS REQUIRED (HW CUTOUTS AS REQD)	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 301 - SGL PRIVATE TOLIET/CLOSER - PRIVACY

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	COAT HOOK	3071	630	TRI

Hardware Group No. 303 - SGL PRIVATE TOLIET - PRIVACY

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	COAT HOOK	3071	630	TRI

Hardware Group No. 341 - SGL PRIVATE TOILET / INDICATOR LOCK

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	COAT HOOK	3071	630	TRI

-INDICATOR ON OUTSIDE OF DOOR.

Hardware Group No. 341-STF - SGL STAFF TOILET / INDICATOR LOCK (NO INDICATOR PER PISD)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/DEADBOLT	L9440 06A L583-363	626	SCH
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	COAT HOOK	3071	630	TRI

-INDICATOR ON OUTSIDE OF DOOR.

Hardware Group No. 401 - SGL PASSAGE/CLOSER

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 401H - SGL PASSAGE/CLOSER/HO ARM

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP H TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 403 - SGL PASSAGE

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 403S - SGL PASSAGE

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 501 - SGL CLASSROOM LOCK/CLOSER/ARMOR PLATE

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	ARMOR PLATE	8400 32" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 550FXG - PR STOREROOM LOCK/CLOSER

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	SEMI-AUTO FLUSH BOLT	3825L (WD) / 3820L (MD) X 3850-AT RATED (TOP ONLY)	630	TRI
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	COORDINATOR	COR X FL BRKTS/SPACERS REQD 3780 AT OUTSWING	628	IVE
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT ACTIVE	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	SURF OVERLAPPING ASTRAGAL	7306A/7306B-A AS REQUIRED (HW CUTOUTS AS REQD)	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
2	EA	DOOR BOTTOM	369AA/355AA-Z49 (WD/MD AS REQ) AS REQD	AA	ZER

-USE 3/4" LATCHBOLT AT FIRE RATED DOORS IF USING CYLINDRICAL LOCKSET

PR STOREROOM LOCK/CLOSER

Hardware Group No. 553 - SGL (CONFIRM FUNCTION) LOCK (SECURITY CLSSRM)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 553G - SGL (CONFIRM FUNCTION) LOCK OHS (SECURITY CLSSRM)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	DOOR BOTTOM	369AA/355AA-Z49 (WD/MD AS REQ)	AA	ZER

SGL (CONFIRM FUNCTION) LOCK OHS (SECURITY CLSSRM)

Hardware Group No. 553S - SGL (CONFIRM FUNCTION) LOCK OHS (SECURITY CLSSRM)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD RHO	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 710M - PR INTERIOR EXIT DEVICES

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954-STAB-MT54 HEIGHT REQD	689	VON
1	EA	PANIC HARDWARE	CDSI-99-L-DT-06-SNB	626	VON
1	EA	PANIC HARDWARE	CDSI-99-L-NL-06-SNB	626	VON
3	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
4	EA	CONST. CORE	BY OWNER		B/O
4	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
2	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

Hardware Group No. 710M-DB - PR INTERIOR EXIT DEVICES

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954-STAB-MT54 HEIGHT REQD	689	VON
1	EA	PANIC HARDWARE	CDSI-99-L-DT-06-SNB	626	VON
1	EA	PANIC HARDWARE	CDSI-99-L-NL-06-SNB	626	VON
3	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
4	EA	CONST. CORE	BY OWNER		B/O
4	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
2	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR BOTTOM	369AA/355AA-Z49 (WD/MD AS REQ)	AA	ZER

Hardware Group No. 710MC - PR INTERIOR EXIT DEVICES (GYM, CAFE)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954-STAB-MT54 HEIGHT REQD	689	VON
1	EA	PANIC HARDWARE	CDSI-99-L-DT-06-SNB	626	VON
1	EA	PANIC HARDWARE	CDSI-99-L-NL-06-SNB	626	VON
3	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
4	EA	CONST. CORE	BY OWNER		B/O
4	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

Hardware Group No. 710MH - PR INTERIOR EXIT DEVICES (GYM, CAFE, LIBRARY)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954-STAB-MT54 HEIGHT REQD	689	VON
1	EA	PANIC HARDWARE	CDSI-99-L-DT-06-SNB	626	VON
1	EA	PANIC HARDWARE	CDSI-99-L-NL-06-SNB	626	VON
3	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
4	EA	CONST. CORE	BY OWNER		B/O
4	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
2	EA	SURFACE CLOSER	4040XP-EDA-SNB	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
2	EA	WALL STOP/HOLDER	1283-6S	626	TRI
	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

TEMPLATE FOR 180-DEG SWING.
PROVIDE BACKER BOARD FOR HOLDERS.

Hardware Group No. 711 - SGL EXIT DEVICE

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	CDSI-99-L-NL-06-SNB	626	VON
1	EA	SFIC MORTISE CYL.	80-102 XQ11-948 X CAM AS REQ	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	CONST. CORE	BY OWNER		B/O
2	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP EDA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 731 - SGL INTERIOR EXIT DEVICES (NON-LOCKING)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	PANIC HARDWARE	LD-99-L-BE-06-SNB	626	VON
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER

Hardware Group No. 800V

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	DUMMY PUSH BAR	330 LENGTH AS REQ	626	VON
2	EA	DOOR PULL	VR910 DT	630	IVE
2	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	MEETING STILE	328AA (2 PCS- 1SET) HEIGHT REQD	AA	ZER
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 801 - SGL PUSH/PULL/CLOSER

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 8" X 16"	630	IVE
1	EA	PULL PLATE	8303 8" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP-RW/PA-TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 900 - OPERABLE FOLDING PARTITION

For use on Door #(s):

Provide each FLD door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

ALL HARDWARE BY OPERABLE WALL PANEL MANUFACTURER.

Hardware Group No. C201 - SGL STOREROOM LOCK/CLOSER (ACCESS CONTROLLED)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW12	652	IVE
1	EA	EU STOREROOM LOCK	ND80BDEU RHO RX CON 12V/24V DC	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO LOCK)		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO POWER SUPPLY)		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO READER)		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		

OPERATIONAL DESCRIPTION: ENTRY BY CARD READER OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES.
DELETE KICKPLATE AT DOOR A115-1

Hardware Group No. C710AM-V - PR VESTIBULE EXIT DEVICES SEC VEST (ACCESS CONTROLLED)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	REMOVABLE MULLION	4954-STAB	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-99-EO-CON-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD-SNB 24 VDC	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO PANIC DEVICE)		SCH
2	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO POWER SUPPLY)		SCH
2	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO READER)		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		
		BALANCE HARDWARE	PROVIDED BY ALUMINUM DOOR MFG.		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

Hardware Group No. C711A - SGL INTERIOR EXIT DEVICE (ACCESS CONTROLLED)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-L-NL-06-CON-SNB 24 VDC	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO READER)		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO READER)		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ (TO READER)		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

Hardware Group No. J714M - PAIR GATE PANICS

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	SET	HINGE/CLOSER	MAMMOTH180-ZILV 180-GATE COMBINED (LOCINOX)		
2	EA	PANIC HARDWARE	LD-PA-98-NL-OP-110MD-WH-SNB-SEC	630	VON
2	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	CONST. CORE	BY OWNER		B/O
2	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
2	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	FLOOR STOP	FS18L AS REQD	BLK	IVE
	EA		FIXED STEEL CENTER MULLION BY MTL FABRICATOR		
	EA		REMAINDER OF HARDWARE BY GATE FABRICATOR		
2	EA	GATE PANIC SHIELD (LOCKEYUSA OR SIM)	TYPE/SIZE/FINISH AS APPLICABLE (GC TO COORD W/RELATED TRADES)		

HARDWARE SET IS A GUIDELINE.
GC AND HARDWARE SUPPLIER TO REVIEW OPENING WITH OWNER/ARCHITECT AT LATER DATE TO DETERMINE EXACT REQUIREMENTS.
PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
GENERAL CONTRACTOR SHALL CONDUCT A COORDINATION MEETING WITH THE HARDWARE SUPPLIER AND GATE/FENCE FABRICATOR PRIOR TO HARDWARE BEING ORDERED - AND FENCE/GATE BEING FABRICATED.

Hardware Group No. J715 - SGL EXTER GATE PANIC

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	SET	HINGE/CLOSER	MAMMOTH180-ZILV 180-GATE COMBINED (LOCINOX)		
1	EA	PANIC HARDWARE	LD-PA-98-NL-OP-110MD-WH-SNB-SEC	630	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GATE PANIC SHIELD (LOCKEYUSA OR SIM)	TYPE/SIZE/FINISH AS APPLICABLE (GC TO COORD W/RELATED TRADES)		
	EA		REMAINDER OF HARDWARE BY GATE FABRICATOR		

HARDWARE SET IS A GUIDELINE.
GC AND HARDWARE SUPPLIER TO REVIEW OPENING WITH OWNER/ARCHITECT AT LATER DATE TO DETERMINE EXACT REQUIREMENTS.
PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
GENERAL CONTRACTOR SHALL CONDUCT A COORDINATION MEETING WITH THE HARDWARE SUPPLIER AND GATE/FENCE FABRICATOR PRIOR TO HARDWARE BEING ORDERED - AND FENCE/GATE BEING FABRICATED.

Hardware Group No. J-2NO PL - PAIR GATE NO PADLOCK/CORE REQUIRED

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA		ALL HARDWARE PROVIDED BY GATE FABRICATOR		B/O

Hardware Group No. J-PL-SL - SLIDING GATE PADLOCK

For use on Door #(s):

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PADLOCK (LFIC/SFIC AS REQD)	KS41D1200 / KS43D3200 X 1-1/2" SHACKLE TYPE AS REQD - SEE REMARK BELOW		SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
	EA		REMAINDER OF HARDWARE BY GATE FABRICATOR		

"LOCK MUST FUNCTION AS NON-KEY RETAINED ON ALL PAD LOCKS" (VERIFY WITH OWNER AT KEYING MEETING)
PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
GENERAL CONTRACTOR SHALL CONDUCT A COORDINATION MEETING WITH THE HARDWARE SUPPLIER AND GATE/FENCE FABRICATOR PRIOR TO HARDWARE BEING ORDERED - AND FENCE/GATE BEING FABRICATED.

Hardware Group No. JC715 - SGL GATE PANIC (ACCESS CONTROLLED)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	SET	HINGE/CLOSER	MAMMOTH180-ZILV 180-GATE COMBINED (LOCINOX)		
1	EA	DOOR CORD	788-18 LESS WIRES	626	SCE
1	EA	ELEC PANIC HARDWARE	LD-WPRX-PA-98-L-M996-06-FSE-WH-SNB-SEC	630	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GATE PANIC SHIELD (LOCKEYUSA OR SIM)	TYPE/SIZE/FINISH AS APPLICABLE (GC TO COORD W/RELATED TRADES)		
	EA		REMAINDER OF HARDWARE BY GATE FABRICATOR		
		CARD READER	BY SECURITY CONTRACTOR		
	EA	POWER SUPPLY	PROVIDED BY SECURITY		

HARDWARE SET IS A GUIDELINE.
GC AND HARDWARE SUPPLIER TO REVIEW OPENING WITH OWNER/ARCHITECT AT LATER DATE TO DETERMINE EXACT REQUIREMENTS.
PROVIDE MOUNTING ACCESSORIES AS REQUIRED.
GENERAL CONTRACTOR SHALL CONDUCT A COORDINATION MEETING WITH THE HARDWARE SUPPLIER AND GATE/FENCE FABRICATOR PRIOR TO HARDWARE BEING ORDERED - AND FENCE/GATE BEING FABRICATED.

Hardware Group No. K201 - SGL KEYPAD LOCK/CLOSER

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	KEYPAD LOCK	P2031BLL	626	DRM
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

ENTRY BY KEYPAD READER OR MANUAL KEY. FREE EGRESS.

Hardware Group No. K711 - SGL EXIT DEVICE

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	EX DEV KEYPAD TRIM	P201U-B-LL	626	DRM
1	EA	PANIC HARDWARE	LD-99-EO-SNB	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	SURFACE CLOSER	4040XP EDA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	DOOR STOP	WS406/WS407CCV (OR FS436 - AS REQD)	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. W714AM - PR EXTERIOR ALUM ENTRANCE EXIT DEVICES (TDI)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	REMOVABLE MULLION	KR4954XP-STAB-MT54	689	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-XP99-EO-CON-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-XP99-NL-OP-110MD-CON-SNB	626	VON
1	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	CONST. CORE	BY OWNER		B/O
2	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
2	EA	WIRE HARNESS (TO READER)	CON-XXP LENGTH AS REQ		SCH
4	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
			DOOR CONTACT - WORK OF DIVISION 28		
		BALANCE HARDWARE	PROVIDED BY ALUMINUM DOOR MFG.		

-VERIFY WINDSTORM “CERTIFICATION” OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-HARDWARE BUILT AS BASIS-OF-DESIGN AROUND KAWNEER DOOR SYSTEM.
-TDI BASIS OF DESIGN (WITH RIM DEVICES/MULLION) BASED ON 90" MAXIMUM STOREFRONT PANELS.
-IF STOREFRONT PANEL SIZE WILL EXCEED 90", PROVIDE ALTERNATIVE CONCEALED ROD "KAW-HH-9947" DEVICES WITHOUT REMOVABLE MULLION.

Hardware Group No. WC345 - SGL EXTERIOR STOREROOM LOCK/CLOSER/SCUSH (ACCESS CONTROLLED/TDI)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	EU MORTISE LOCK W/ INDICATOR XL13-346	L9492TEU 06A L583-363 XL13-346 RX DM CON 12/24 VDC	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	LOCK GUARD	LG1	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	DOOR SWEEP	FAS-SEAL		STE
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
1	SET	WEATHER STRIP	PS-074-HEAD & JAMBS		STC
2	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		

-VERIFY WINDSTORM "CERTIFICAITON" OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-SPECIFIED HARDWARE WITH BASIS-OF-DESIGN AROUND STEELCRAFT DOOR SYSTEM.
OPERATIONAL DESCRIPTION: ENTRY BY CARD READER OR MANUAL KEY OVERRIDE. FREE EGRESS AT ALL TIMES.

Hardware Group No. WC714AM - PR EXTERIOR ALUM ENTRANCE EXIT DEVICES (ACCESS CONTROLLED/TDI)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	REMOVABLE MULLION	4954XP STAB	689	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-XP99-EO-CON-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-XP99-NL-OP-110MD-CON-SNB 24 VDC	626	VON
1	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
2	EA	WIRE HARNESS (TO READER)	CON-XXP LENGTH AS REQ		SCH
4	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		
		BALANCE HARDWARE	PROVIDED BY ALUMINUM DOOR MFG.		

-VERIFY WINDSTORM “CERTIFICATION” OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-HARDWARE BUILT AS BASIS-OF-DESIGN AROUND KAWNEER DOOR SYSTEM.
-TDI BASIS OF DESIGN (WITH RIM DEVICES/MULLION) BASED ON 90" MAXIMUM STOREFRONT PANELS.
-IF STOREFRONT PANEL SIZE WILL EXCEED 90", PROVIDE ALTERNATIVE CONCEALED ROD "KAW-HH-9947" DEVICES WITHOUT REMOVABLE MULLION.

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

Hardware Group No. WC714M - PR EXTERIOR HM ENTRANCE EXIT DEVICES (ACCESS CONTROLLED/TDI)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	FIRE RATED REMOVABLE MULLION	HH-9954B	689	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-XP99-EO-CON-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-XP99-NL-OP-110MD-CON-SNB 24 VDC	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	JAMB SEAL	328AA-2PC-JAMB HEIGHT	AA	ZER
1	EA	HEADER SEAL	429AA-1PC HEADER WIDTH	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
4	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
2	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		

-VERIFY WINDSTORM “CERTIFICATION” OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-HARDWARE BUILT AS BASIS-OF-DESIGN AROUND STEELCRAFT DOOR SYSTEM.
-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PADS.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

Hardware Group No. WC714MELC - PR EXTERIOR HM ELEC RM EXIT DEVICES (TDI)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	FIRE RATED REMOVABLE MULLION	HH-9954B	689	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-XP99-NL-OP-110MD-CON-SNB 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-XP99-EO-CON-SNB	626	VON
1	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	CONST. CORE	BY OWNER		B/O
2	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
	EA	JAMB SEAL	328AA-2PC-JAMB HEIGHT	AA	ZER
1	EA	HEADER SEAL	429AA-1PC HEADER WIDTH	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
2	EA	WIRE HARNESS (TO READER)	CON-XXP LENGTH AS REQ		SCH
4	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
			DOOR CONTACT - WORK OF DIVISION 28		
		BALANCE HARDWARE	PROVIDED BY ALUMINUM DOOR MFG.		

-VERIFY WINDSTORM “CERTIFICATION” OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-HARDWARE BUILT AS BASIS-OF-DESIGN AROUND KAWNEER DOOR SYSTEM.
-TDI BASIS OF DESIGN (WITH RIM DEVICES/MULLION) BASED ON 90" MAXIMUM STOREFRONT PANELS.
-IF STOREFRONT PANEL SIZE WILL EXCEED 90", PROVIDE ALTERNATIVE CONCEALED ROD "KAW-HH-9947" DEVICES WITHOUT REMOVABLE MULLION.

Hardware Group No. WC715 - SGL EXTERIOR HM ENTRANCE EXIT DEVICE (ACCESS CONTROLLED/TDI)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-XP99-NL-OP-110MD-CON-SNB 24 VDC	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS WHERE APPLICABLE	630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	DOOR SWEEP	FAS-SEAL		STE
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
1	SET	WEATHER STRIP	PS-074-HEAD & JAMBS		STC
2	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		

-VERIFY WINDSTORM “CERTIFICATION” OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-HARDWARE BUILT AS BASIS-OF-DESIGN AROUND STEELCRAFT DOOR SYSTEM.
-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-OMIT POWER SUPPLY WHERE PROVIDED BY SECURITY.

Hardware Group No. WC715V - SGL EXTERIOR HM KITCHEN EXIT DEVICE (ACCESS CONTROLLED)

For use on Door #(s):

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-XP99-NL-OP-110MD-CON-SNB 24 VDC	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP-SHCUSH-SNB	689	LCN
2	EA	ARMOR PLATE	8400 32" X 2" LDW B-CS BOTH SIDES	630	IVE
1	EA	EX DEV END GUARD	K-12S-VON (VERIFY REQMNT/TYPE)		KEE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	EA	DOOR SWEEP	FAS-SEAL		STE
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
1	SET	WEATHER STRIP	PS-074-HEAD & JAMBS		STC
2	EA	VIEWER	698	626	IVE
2	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
1	EA	WIRE HARNESS	CON-XXP LENGTH AS REQ		SCH
	EA	MULTITECH READER	MT15/MT11 - BY SECURITY CONTRACTOR	BLK	SCE
			POWER SUPPLY - WORK OF DIVISION 28		
			DOOR CONTACT - WORK OF DIVISION 28		

-INGRESS BY THE CREDENTIAL READER OR KEY OVERRIDE.
-FREE EGRESS BY THE PUSH PAD.
-COORDINATE POWER SUPPLY WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS.
-DOOR VIEWER AT 4′ AND 5′ AFF.

Hardware Group No. WD214 - PR EXTERIOR STOREROOM LOCK/CLOSER/SCUSH - TDI

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	628	IVE
2	EA	SURFACE BOLT	SB360 12"	US2C	IVE
1	EA	STOREROOM LOCK	L9080BD 06A	626	SCH
1	EA	CONST. CORE	BY OWNER		B/O
1	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	COORDINATOR	3780	628	ABH
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ ACTIVE LEAF	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	SURF OVERLAPPING ASTRAGAL	7306A/7306B-A AS REQUIRED (HW CUTOUTS AS REQD)	630	IVE
1	EA	RAIN DRIP	142A DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
2	EA	DOOR SWEEP	FAS-SEAL		STE
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
1	SET	WEATHER STRIP	PS-074-HEAD & JAMBS		STC
			DOOR CONTACT - WORK OF DIVISION 28		

-VERIFY WINDSTORM "CERTIFICAITON" OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-SPECIFIED HARDWARE WITH BASIS-OF-DESIGN AROUND STEELCRAFT DOOR SYSTEM.

Hardware Group No. WD714M - PR EXTERIOR ALUM ENTRANCE EXIT DEVICES (TDI)

For use on Door #(s):

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY TWP CON	628	IVE
1	EA	FIRE RATED REMOVABLE MULLION	HH-9954B	689	VON
1	EA	ELEC PANIC HARDWARE	LD-LXRX-LC-XP99-EO-CON-SNB	626	VON
1	EA	ELEC PANIC HARDWARE	LXRX-LC-XP99-NL-OP-110MD-CON-SNB	626	VON
1	EA	SFIC CYLINDER	(TYPE/QTY AS REQD)	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	CONST. CORE	BY OWNER		B/O
2	EA	PERM SFIC CORE (TYPE/QTY REQD)	MATCH OWNER'S EXISTING SYSTEM (CORMAX PATD)	626	BES
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MFR		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH (OR AS DETAILED)	A	ZER
2	EA	WIRE HARNESS (TO READER)	CON-XXP LENGTH AS REQ		SCH
4	EA	WIRE HARNESS (1 IN DOOR & 1 IN FRAME)	CON-XXP LENGTH AS REQ		SCH
			DOOR CONTACT - WORK OF DIVISION 28		
		BALANCE HARDWARE	PROVIDED BY ALUMINUM DOOR MFG.		

-VERIFY WINDSTORM “CERTIFICATION” OF SPECIFIED HARDWARE W/DOOR SYSTEM.
-HARDWARE BUILT AS BASIS-OF-DESIGN AROUND KAWNEER DOOR SYSTEM.
-TDI BASIS OF DESIGN (WITH RIM DEVICES/MULLION) BASED ON 90" MAXIMUM STOREFRONT PANELS.
-IF STOREFRONT PANEL SIZE WILL EXCEED 90", PROVIDE ALTERNATIVE CONCEALED ROD "KAW-HH-9947" DEVICES WITHOUT REMOVABLE MULLION.

END OF SECTION

OPT0278106 Version 5

Door#	HwSet#
A101-1	WC714AM
A101-2	C710AM-V
A103-1	C711A
A103-2	801
A103-3	401H
A104-1	301
A105-1	103
A106-1	101
A106-2	101
A107-1	103-CH
A108-1	203
A109-1	303
A110-1	303
A112-1	101
A113-1	103-CH
A114-1	K711
A115-1	K201
A116-1	301
A117-1	301
A118-1	103-CH
A118-2	103
A119-1	103-CH
A120-1	101
A121-1	K711
A122-1	103
A122A-1	203
A123-1	103
A124-1	101-CH
A125-1	C201
A126-1	212
A126-2	212
A126-3	212
A126A-1	201
A127-1	710MC
A128-1	553
A129-1	403
A129-2	403
A130-1	553
A131-1	103
A131-2	103
A131-3	103
A131-4	103
A132-1	553
A133-1	403
A133-2	403

Door#	HwSet#
A134-1	553
A136-1	103
A137-1	203
A138-1	103
A140-1	710MC
A140-2	710M-DB
A143-1	403
A145-1	203
A203-1	711
A203-2	711
A204-1	711
A204-2	711
A205-1	103
A206-1	103
A207-1	103-CH
A208-1	103-CH
A209-1	103-CH
A210-1	203
B100-1	WC714AM
B101-1	710MH
B101-2	WC714AM
B101-3	W714AM
B102-1	710MH
B102-2	WD714M
B102-3	WC714M
B102-4	900
B102-5	900
B103-1	212
B103-2	WD214
B104-1	103
B107-1	212
B108-1	201
B109-1	550FXG
B109A-1	553G
B110-1	C201
B111-1	103
B112-1	203
B113-1	710M
B116-1	341-STF
B117-1	341-STF
B118-1	201
B119-1	002
B119-2	002
B119-3	002
B120-1	WC715V
B121-1	001.1

Door#	HwSet#
B122-1	203
B123-1	801
B123A-1	341
B124-1	203
B127-1	103
B128-1	WC345
B129-1	203W
B130-1	WC714MELC
B131-1	WC714MELC
B131-2	401
B132-1	731
B132-2	WC715
C101-1	201
C102-1	553
C103-1	553
C104-1	553
C106-1	WC714AM
C106-2	800V
C107-1	553
C108-1	553
C109-1	553
C110-1	C201
C111-1	203
C112-1	553
C113-1	203
C114-1	553
C115-1	203
C116-1	200C
C120-1	341-STF
C121-1	103
C122-1	203
C124-1	711
C125-1	711
C200-1	710M
C201-1	C201
C202-1	553
C203-1	553
C204-1	553
C206-1	800V
C207-1	553
C208-1	553
C209-1	553
C210-1	200
C214-1	341-STF
C215-1	103
C216-1	203

Door#	HwSet#
D100-1	WC714AM
D100-2	711
D100-3	WC714AM
D100-4	WC714AM
D101-1	553
D102-1	553
D103-1	553
D105-1	WC714AM
D105-2	800V
D106-1	553
D107-1	553
D108-1	553
D109-1	C201
D110-1	203
D111-1	200C
D115-1	341-STF
D116-1	103
D117-1	203
D120-1	711
D121-1	003
D122-1	203
D122A-1	201
D123-1	553S
D124-1	403
D125-1	553S
D126-1	403S
D126-2	403S
D127-1	553S
D129-1	WC714AM
D129-2	800V
D130-1	553S
D131-1	403S
D131-2	403S
D132-1	553S
D133-1	553
D134-1	403
D135-1	711
D136-1	501
D136-2	203
D137-1	200C
D139-1	341-STF
D140-1	103
D141-1	203
D143-1	711
D144-1	C201
D200-1	710M

Door#	HwSet#
D201-1	203
D202-1	553
D203-1	553
D204-1	553
D206-1	800V
D207-1	553
D208-1	553
D209-1	553
D210-1	341-STF
D211-1	201
D213-1	103
D214-1	341-STF
D215-1	103
D219-1	200C
D220-1	711
D221-1	711
D222-1	553
D223-1	553
D224-1	553
D225-1	003
D226-1	203
D227-1	C201
D228-1	553
D229-1	553
D230-1	553
D232-1	800V
D233-1	553
D234-1	553
D235-1	553
D237-1	200C
D241-1	103
D242-1	203
D243-1	341-STF
GATE-1	J-PL-SL
GATE-2	J715
GATE-3	J714M
GATE-4	J714M
GATE-5	J-PL-SL
GATE-6	J-2NO PL
GATE-7	JC715
GATE-8	J-PL-SL
GATE-9	J715
GATE-10	J715
GATE-11	J715
GATE-12	J-PL-SL
GATE-13	J-PL-SL

Door#	HwSet#
GATE-14	J715
GATE-15	J715
GATE-16	J714M
GATE-17	J714M
GATE-18	J715
GATE-19	J714M

SECTION 08 80 00

GLAZING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Exterior glass and aluminum framing systems and storefront systems.
   02 Interior glass and aluminum framing systems and storefront systems.
   03 Glazing of plastic laminate doors.
   04 Glazing of hollow metal doors.

C. Related Work:
   01 Section 06 10 00 – Rough Carpentry
   02 Section 08 11 13 – Hollow Metal Doors and Frames
   03 Section 08 14 23.16 – Plastic Laminate Faced Wood Doors
   04 Section 08 56 19 – Interior Transaction Windows
   05 Section 08 71 00 – Door Hardware
   06 Section 08 87 23 – Security and Safety Film

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Design Calculations: Provide engineering calculations, signed and sealed by a Texas Registered Structural Engineer, which demonstrate the design, assemblies and anchoring of proposed glazing assemblies meet or exceed the stated wind load requirements for all conditions.

G. Samples: Show manufacturer's full range of colors:
   01 Samples of each type of glass (12" x 12" minimum).
   02 In place sample of sealant at frame perimeter for Architect's approval. Architect shall select samples for review from manufacturer's full color line.
   03 Obtain hardware templates from finish hardware supplier.
   04 Samples of framing finish for approval and fastener types.
   05 Sample of proposed sub-sill flashing; minimum 12" in length, complete with end dams on both ends.

H. Mock-up:
   01 In conjunction with mock-up wall required for masonry and back-up walls, provide a mock-up window incorporated into the masonry mock-up.
   02 Mock-up window shall be minimum 16" x 16" and shall include head, jamb, sill framing members and sub-sill flashing. Glass is not required.
   03 Construct in such a way that all fastening methods are viewable.
   04 Perimeter of window shall be sealed continuous.

I. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   01 ANSI Z97.1 – American National Standard for Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

B. American Society for Testing and Materials (ASTM):
   01 ASTM C162 – Standard Terminology for Glass and Glass Products.
   02 ASTM E774 – Standard Specification for Sealed Insulating Glass Units.
   03 ASTM C920 Standard Specification for Elastomeric Joint Sealants.
   04 ASTM C1036 – Standard Specifications for Flat Glass.
   05 ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
   06 ASTM C1376 – Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
   07 ASTM E783 – Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Door
   08 ASTM E1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
   09 ASTM E1300 – Standard Practice for Determining the Minimum Thickness and Type of Glass Required to Resist a Specified Load.
   10 ASTM E2010-01 – Standard Test Methods for Positive Pressure Fire Tests for Window Assemblies.
   11 ASTM E2188 – Standard Test Method for Insulating Glass Unit Performance.
   12 ASTM E2189 – Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
   13 ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.

C. American Architectural Manufacturers Association (AAMA)
   01 AAMA 502 – Specification for Field Testing of Newly Installed Fenestration Products.
   02 AAMA 503 – Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.

D. Federal Specifications:
   01 Fed. Spec. DD-G-001403 B.
   02 Fed. Spec. TT-S-00230 Sealing Compound: Synthetic Rubber Base and TT-S-00203C.
   03 Fed. Spec. TT-S-001657 Sealing Compound: Butyl Rubber Base.
   04 Fed. Spec. DD-G-451d.

E. National Fire Protection Association (NFPA):
   01 NFPA 80 – Fire Doors and Windows.
   02 NFPA 252 – Fire Tests of Door Assemblies.
   03 NFPA 257 – Fire Tests of Window Assemblies.

1.4 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Provide aluminum framing systems, doors, and windows from one source and supplied by a single manufacturer.

C. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in:
   01 Flat Glass Marketing Association:
      a. Glazing Sealing Systems Manual.
      b. Glazing Manual.

D. Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire protective assemblies.

E. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per ASTM E2074-00, classified and labeled by UL acceptable to authorities having jurisdiction.

F. Field Testing:
   01 Water penetration and air infiltration field testing shall be performed by the Materials & Testing Laboratory or by a third-party building envelope testing consultant under separate contract with the Owner.
   02 Testing of three (3) different locations shall be performed at the following intervals of the glazing installation: 10% complete, 50% complete and 90% complete.
   03 Specific test locations shall be determined on the day of the testing; and may include both first and second floor locations.
   04 Refer to Part 3 – Execution for additional information.

G. Manufacturer's Field Representation:
   01 The manufacturer shall provide on-site observation by a qualified technical representative familiar with the window systems being installed at the following times:

a. Commencement of Window Installation: Representative shall observe the complete installation of the first window being installed.
b. Field Testing: Representative shall be present for all field testing of windows and glazing.
c. Periodic site observation visits during window / glazing installation at the following intervals of installation completeness: 25%, 50%, 75% and 100%.

02 Within seventy-two (72) hours after each site observation visit, the manufacturer's representative shall furnish an observation report documenting activities, direction to the installer, and other pertinent information.

1.5 WARRANTY

A. Submit a written warranty, executed by the entrance manufacturer, agreeing to repair or replace units that fail in workmanship for a period of five (5) years from date of Substantial Completion. Failures include, but are not limited to:
01 Structural and performance failures, including excessive deflection, excessive leakage, air infiltration beyond specified requirements.
02 Faulty operation of hardware directly related to items listed above.
03 Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design of aluminum framing systems, storefronts and doors is based on materials / systems / assemblies as manufactured by Oldcastle Building Envelope.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this section, provided all proposed products meet or exceed the specified requirements.
01 Kawneer North America
02 Tubelite Glass & Aluminum Solutions
03 YKK AP American, Inc.
04 EFCO

C. Glass: The following manufacturers are acceptable to provide glass products in accordance with the specified requirements:
01 AGC Flat Glass North America, Inc. (formerly AFG Industries, Inc.)
02 HGP Industries, LLC
03 Oldcastle Building Envelope
04 Vitro (formerly PPG Industries)
05 TGP Architectural

2.2 PERFORMANCE SPECIFICATIONS

A. Requirements apply simultaneously through the most adverse conditions of each exterior application.
01 Thermal Movement at Exterior Systems: Provide for noiseless expansion and contraction of all materials and assemblies due to temperature changes in a range between 10°F and 180°F, without detriment to appearance or performance.

02 Water Infiltration at Exterior Systems: Drain water entering at joints and condensation occurring within the wall construction to the exterior face of the wall. Allow no uncontrolled water other than condensation on the interior face of the wall.

03 Air Filtration at Exterior Locations: Limit air leakage to maximum 0.005 CFM/SF at 6.24 PSF.

2.3 GENERAL MATERIALS

A. Aluminum:

01 ASTM B221 – alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

02 Provide minimum thickness of 0.125 inch for framing members and 0.050 inch for glazing stops and similar components.

B. Internal Reinforcing:

01 ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.

02 Shapes and sizes to suit installation.

03 Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with Federal Spec. TT-P-645.

04 Provide steel reinforcing in aluminum framing as required to achieve specified wind load resistance.

C. Inserts and Anchorage Devices:

01 Manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars or tubes.

02 Hot-dip galvanize steel assemblies after fabrication; comply with ASTM A123, 2.0 ounce minimum coating.

03 Provide all anchoring angles, plates, fasteners and accessories required for secure attachment to adjacent work.

D. Fasteners:

01 Type 304 or 316 stainless steel for fastening into treated wood.

02 Type 304 or 316 stainless steel for exposed locations.

03 Provide nuts or washers of design having the means to prevent disengagement; deforming of fastener threads is not acceptable.

04 Provide concealed fasteners wherever possible.

05 For exposed locations, provide countersunk flathead fasteners with finish matching item fastened.

06 All fasteners used to secure the sub-sill flashing and sill frame member shall be bedded in sealant at penetrations through window assembly components. Heads of fasteners at these locations shall be covered with sealant.

E. Sub-Sill Flashing:

01 All exterior glazed systems / window walls / windows shall be furnished with continuous sub-sill flashing, spanning the full width of the rough opening.

02 Sub-sill flashing shall be minimum 0.065” aluminum with integral (turned up) end dams and back dams. Minimum height of dams shall be 1”.

03 Open vertical joint at end dam / back dam junction shall be welded continuous to form a seamless dam component directing any / all trapped water to outside of building. Provide thicker material than specified above if required to meet this requirement.

04 Sub-sill flashing shall extend to the exterior building face / veneer and turn down 3/4".

05 All exposed edges shall be ground to eliminate sharp edges and corners. Hemmed edges are acceptable.
06 Finish of sub-sill flashing shall match frame finish.

F. Miscellaneous Materials:
01 Provide material isolators at all dissimilar metals in contact with aluminum framing components.
02 Where indicated on the Drawings provide minimum 0.080" aluminum extrusions or break metal between non-contiguous framing components (i.e. segmented radius walls, column wraps, etc.). Fabricate as required for concealed fastening.

G. Glazing Materials at Aluminum Framing:
01 Glazing Gaskets: Extruded neoprene conforming to ASTM C502 (color "black"), sized to fit the frame.
02 Sealant: Comply with Federal Spec. TT-S-00230.

H. Glazing Materials at Hollow Metal Frames:
01 General: Use glazing compound and preformed glazing sealants approved for the application, except as otherwise specified, conforming to Glazing Materials portion of the FGMA Glazing Manual.
02 Sealant:
a. One part acrylic polymer sealant conforming to Federal Spec. TT-S-00230 or silicone, Federal Spec. TT-S-0023-C. Use for glazing of all fixed glass. Include primer as recommended by manufacturer.
b. Color: Shall as selected by Architect from manufacturer's full range.
c. All sealants shall be compatible with adjacent material per manufacturer's recommendations and instructions.
03 Setting Blocks: Hard rubber or clean grain softwood.
04 Back-up Material: Foamed polyethylene or polystyrene rod stock; sizes as required by joint condition, and compatible with sealant.
05 Glazing Tape: DAP #1202 or as approved.
06 Glazing Gaskets: Extruded neoprene, free of porosity, surface defects, dimensional irregularities, and conforming to physical properties of ASTM C502.
07 Use of metal sash putty will not be permitted, but compound conforming to Federal Spec. T-G-410 will be permitted. The use of non-skinning compounds, non-resilient type preformed sealers and preformed impregnated type gaskets will not be permitted.

2.4 GLASS MATERIALS

A. Glass Type G-1: Insulated Fire Rated Glass:
01 Design is based on TPG FireLite IGU series.
02 Overall thickness of 1" comprised of 2 lites of 1/4" glass separated by a 1/2" air space.
03 Air space to be dual sealed and meeting the certification requirements of the IGCC for a CBA rating.
04 Exterior / Outboard Lite shall be:
a. Fully Tempered Tinted Glass.
b. Complying with ASTM C1048, Type I, Class 2 (tinted), Quality 3, Kind FT.
c. Tinting shall be TBD.
05 Interior / Inboard Lite shall be:
a. Clear FireLite Plus Glass with Premium surface finish.
b. Complying with Impact Safety Rating: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
c. Clear.

B. Glass Type G-2: Fully Tempered Clear Glass:
   01 1/4" thick.
   02 Complying with ASTM C1048, Type 1, Class 1 (clear), Quality 3, Kind FT.
   03 Clear.
   04 Use at all non-fire-rated interior glazing unless indicated otherwise.

C. Glass Type G-3: Fire-Rated Safety Wired Glass:
   01 1/4" thick clear with fire-rated surface film.
   02 Provide fire-rating of 20 minutes to 90 minutes for doors and 20 minute to 45 minute for other applications.
   03 Complying with ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
   04 Wire pattern shall be straight diamond mesh or square grid, as selected by Architect.

D. Glass Type G-4: Insulated Glass:
   01 Overall thickness of 1” comprised of 2 lites of 1/4” glass separated by a 1/2” air space.
   02 Air space to be dual sealed and meeting the certification requirements of the IGCC for a CBA rating.
   03 Exterior / Outboard Lite shall be:
      a. Fully Tempered Tinted Glass.
      b. Complying with ASTM C1048, Type I, Class 2 (tinted), Quality 3, Kind FT.
      c. Tinting shall be *TBD*
   04 Interior / Inboard Lite shall be:
      a. Fully tempered glass.
      b. Complying with ASTM C1048, Type 1, Class 1 (clear), Quality 3, Kind FT.
      c. Clear.

E. Glass Type G-5: Insulated Spandrel Glass:
   01 Overall thickness of 1” comprised of 2 lites of 1/4” glass separated by a 1/2” air space.
   02 Air space to be dual sealed and meeting the certification requirements of the IGCC for a CBA rating.
   03 Exterior / Outboard Lite shall be:
      a. Fully Tempered Tinted Glass.
      b. Complying with ASTM C1048, Type I, Class 2 (tinted), Quality 3, Kind FT.
      c. Tinting shall be *TBD*
      d. Ceramic Enamel Frit: color as selected by Architect from manufacturer’s full range of available colors / finishes.
   04 Interior / Inboard Lite shall be:
      a. Fully tempered glass.
      b. Complying with ASTM C1048, Type 1, Class 1 (clear), Quality 3, Kind FT.
      c. Clear.

F. Glass Type G-6: Acoustical Glass:
   01 Overall thickness of nominal 1” comprised of one lite of 1/4” clear laminated safety glass and one lite of 3/8” clear laminated safety glass separated by a nominal 3/8” air space.
   02 Laminating interlayer materials shall be Polyvinyl Butryal (PVB) sheet; .020” minimum.

03 Dual sealed with a primary seal of polyisobutylene (PIB) and a secondary seal of silicone or organic sealant as recommended by the manufacturer for the specific application.
04 Minimum STC Rating: 48
05 Install in sound control door assemblies provided in Section 08 34 73 – Sound Control Door Assemblies; and window assemblies where indicated on the Drawings.

2.5 EXTERIOR ALUMINUM STOREFRONT DOORS

A. Exterior Aluminum Entrance Doors: design is based on Oldcastle “Rugged” WS Wide Stile door unit assembly.
01 Nominal depth: 2”, fabricated with 0.188” minimum thickness aluminum at all tubular sections.
02 Vertical Stiles: 5”.
03 Top Rail: 5-3/4”.
04 Bottom Rail: 10”.
05 Standard Structural Shapes, Rolled or Extruded Aluminum: Alloy 6061-T6.
06 Connections: Provide bolted and welded connections, fit to a hairline joint.
07 Provide reinforcing at bolted attachments. Tapped aluminum is not permitted.
08 Provide concealed screws, nuts, bolts, and anchors, except hardware screws on hinge and closer-arm of door, of non-corrosive metal.
09 Finish: Clear anodized aluminum.
10 Glass in Exterior Doors: Type G-2 G-4 G-7 at all exterior locations.
11 Use manufacturer’s recommended gaskets for flush glazing (color “black”).
12 Refer to Section 08 71 00 – Door Hardware for finish hardware requirements. Coordinate with other trades as required.

2.6 EXTERIOR ALUMINUM FRAMING SYSTEMS

A. Aluminum Storefront / Entrance Framing System: Design is based on Oldcastle Reliance Curtain Wall series.
01 Size: 2-1/2" x 6” mullion profile; to accept 1” glazing.
02 Pressure glazed, front set, exterior loaded; available with butt glazed verticals.
03 Provide sub-frames at door jambs on entrances as required to accept Rugged WS doors.
04 Provide mullion reinforcement, if necessary, to achieve structural requirements to meet wind load criteria.
05 Intermediate horizontal mullions shall be undersized a minimum of 1 inch less depth than perimeter / primary framing member size.
06 Finish: Clear anodized aluminum.
07 Glass: Type G-2 G-4 G-7 at all exterior locations. Provide glass Type G-5 where indicated.
08 Glass pockets shall be sized to accept glass specified.
09 Provide continuous, full depth sill flashing with end dams at all sill sections.

2.7 INTERIOR ALUMINUM FRAMING SYSTEMS

A. Aluminum Framed Systems: design is based on Oldcastle FG-2000 Flush Glazed Storefront system:
01 Size: 1-3/4" x 4-1/2” mullion profile; center set, exterior loaded; to accept 1/4" glazing.
02 Provide mullion reinforcement, if necessary, to achieve structural requirements to meet loading criteria.
03 Finish: Clear anodized aluminum.
04 Glass: Type G-2.

05 Glass pockets shall be sized to accept glass specified.

B. Interior Aluminum Entrance Doors: design is based on Oldcastle Series 500 Wide Stile door unit assembly.
   01 Nominal depth: 1-3/4”, fabricated with 0.125” minimum thickness aluminum at all tubular sections.
   02 Vertical Stiles: 5-1/2”.
   03 Top Rail: 4-1/2”.
   04 Bottom Rail: 8-1/2”.
   05 Standard Structural Shapes, Rolled or Extruded Aluminum: Alloy 6063-T5.
   06 Provide concealed screws, nuts, bolts, and anchors, except hardware screws on hinge and closer-arm of door, of non-corrosive metal.
   07 Finish: Clear anodized aluminum.
   08 Glass: Type G-2 at all interior locations.
   09 Use manufacturer’s recommended gaskets for flush glazing (color “black”).
   10 Refer to Section 08 71 00 – Door Hardware for finish hardware requirements. Coordinate with other trades as required.

2.8 SOLAR CONTROL DEVICES

A. Design of solar control devices is based on Oldcastle Solar Shelf series.

B. Solar Shelf™ light shelf system is comprised of wall mount, panel retainer, shelf struts, cover retainer, cover and aluminum panels that are anchored directly to the window framing.

C. Each unit shall be comprised of continuous aluminum extrusions with a maximum length of 24 feet and .090 aluminum panels with a maximum length of 10 feet; interior fascia shall be made from choice of standard profiles or custom profiles on request.

D. Overall shelf assembly nominal thickness shall be 2”

E. Overall projection depth of 30” maximum shall be as indicated on the Drawings.

F. Panels shall be made from .090 aluminum sheets and may be anodized finish to match window framing system.

G. Take accurate field measurements to verify required dimensions prior to fabrication.

H. Fabricate components true to detail and free from defects impairing appearance, strength or durability.
   01 Fabricate custom extrusions indicated and as necessary for complete installation.

I. Fabricate components to allow for accurate and rigid fit of joints and corners. Match components carefully ensuring continuity of line and design. Ensure joints and connections will be flush.

J. Fabricate components in accord with accepted shop drawings.
   01 Remove burrs and ease edges.
   02 Shop fabricate to greatest extent practicable to minimize field cutting, splicing, and assembly.
   03 Disassemble only to extent necessary for shipping and handling limitations.

K. Conceal fasteners wherever possible.

L. Location of exposed joints is subject to Architect's acceptance.

M. Light shelves may be installed in two basic configurations:
   01 Light shelf to be run from wall to wall and shall not require end caps to any of the sections (open ended).
   02 Light shelf used in conjunction with punched openings, shall have end caps installed on each end, attached to the shelf struts.

N. Allow for adequate clearance around perimeter of system to enable proper installation and for thermal movement within system.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Thoroughly examine conditions at each and every location under which Work of this Section will be performed.
   01 Verify that each rough opening is the correct size for the framing being installed. Maximum allowable joint at perimeter of framing shall be 5/8”. Inform General Contractor of any non-conforming rough openings and do not proceed until unsatisfactory conditions are corrected.
   02 Verify that the sub-sill substrate is continuous, solid, level and at the proper elevation for installation of sub-sill flashing. Sub-sill flashing must be set in a 100% bed of sealant without any voids. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that wood blocking, thru-wall flashing, masonry and other adjacent work is installed as required for the proper installation of aluminum framing prior to proceeding. Inform General Contractor of any non-conforming work and do not proceed until unsatisfactory conditions are corrected.

C. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
   01 Remove protective coatings which fail in adhesion or interfere with bond of sealants.
   02 Comply with manufacturer’s' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
   03 Prime surfaces to receive glazing compounds in accordance with manufacturer's recommendations.

3.2 INSTALLATION – ALUMINUM FRAMING

A. Install all aluminum framing in strict accordance with the manufacturer’s installation standards and recommendations; firmly anchored for long life under hard use.

B. All exterior sill members shall be installed with continuous aluminum sub-sill flashing.
   01 Set sub-sill flashing in 100% bed of sealant. Carefully clean off excess sealant after sub-sill flashing is set in place.
   02 All fasteners used to anchor sub-sill flashing shall be completely bedded in sealant prior to installation of sill framing.
   03 All fasteners securing sill framing which penetrates through sub-sill flashing shall be installed through a sealant bed as required to maintain the waterproof integrity of the sub-sill flashing / sill-framing assembly.
   04 Coordinate with dampproofing sub-contractor to install additional thru-wall flashing at base of jambs to lap over / onto aluminum sub-sill flashing – prior to installation of aluminum framing member(s). Coordinate as required.

C. Shim and center framing within rough opening. Maximum sealant joint at perimeter of framing shall be 5/8". Coordinate with other trades to correct rough opening where perimeter joint will exceed 5/8".

D. Erection Tolerances:
   01 Maximum Deviation from Vertical: 1/8 inch in any story and 1/4 inch in any 45 foot run.
   02 Maximum Deviation from Horizontal: 1/8 inch in any 30 foot run.
   03 Maximum Deviation from True Alignment: 1/32 inch from any two abutting units; and horizontal components meeting at a vertical mullion. Allow no edge projections.
   04 Maximum Joint Cap: 1/32 inch.
   05 Maximum Openings Between Movable Glazing Stop and Adjacent Member: 1/32 inch.

3.3 INSTALLATION – GLASS

A. Inspect each piece of glass immediately prior to start of installation.
   01 Do not install items which are improperly sized, have damaged edges, are scratched, abraded, or damaged in any other manner.
   02 Do not remove labels from glass until so directed by the Architect.
   03 Install glass so distortion waves, if present, run in a horizontal direction.

B. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass manufacturer.
   01 Use blocks of proper size to support the glass in accordance with the manufacturer's recommendations.
   02 Provide spacers for all glass sizes larger than 50 united inches, to separate glass from stops, except where continuous glazing gaskets or felts are provided.
      a. Locate spacers no more than 24 inches apart, and no closer than 12 inches to a corner.
      b. Place spacers opposite one another.
      c. Make bite of spacer on glass 1/4 inch or more.

C. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.

D. Do not use two different glazing materials in the same joint system, unless the joint use is approved in advance by the Architect.

E. Mask, or otherwise protect surfaces adjacent to installation or sealants.

F. Install all glass, gasket and aluminum framing in strict accordance with manufacturer's printed instructions.

G. Caulk joints continuous at exterior and interior faces of framing and elsewhere as indicated, as required to meet performance specifications using materials specified in Section 07 92 00 – Joint Sealants. Follow sealant manufacturer’s printed instructions for the installation of his product.

3.4 FIELD TESTING

A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured.

01 Interior finishes at window recess (i.e. gypsum board, window sill) shall not be installed at window units to be tested.
02 If interior finishes at window recess have been installed at windows to be tested, they shall be removed by Contractor prior to testing; and then reinstalled at no additional cost to the Owner.

B. Manufacturer's representative shall be present to observe all field tests and retests.

C. Testing:
01 Testing shall be performed per AAMA 503 by a qualified independent testing agency.
02 Air Infiltration Tests: Conduct tests in accordance with ASTM E783.
a. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft2, whichever is greater.
03 Water Infiltration Tests: Conduct tests in accordance with ASTM E1105.
a. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 PSF.

D. Failed Tests:
01 Tests not meeting specified performance requirements and units having deficiencies shall be corrected by the Contractor and the failed window unit / area shall be retested.
02 In addition to retesting the failed window unit / area, an additional two (2) similar window units / areas shall be tested.
03 All retesting and testing caused by a failed test shall be at the expense of the Contractor.

3.5 PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass.
01 Do not apply warning markings, streamers, ribbons, or other items directly to the glass, except as specifically directed by the Architect.

B. Protect all window framing during and after installation from marring, blemishes, scratches and damage due to incidental adjacent work.
01 If damaged, make all necessary repairs or replacements in accordance with the manufacturer's recommendations and as directed by the Architect.

END OF SECTION

SECTION 08 87 23

SAFETY AND SECURITY FILMS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Application of Safety and Security Film on interior and exterior glass surfaces as indicated or scheduled on the Drawings and as specified.

C. Related Work:
   01 Section 08 11 13 – Hollow Metal Doors and Frames
   02 Section 08 80 00 – Glazing

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Minimum size shall be 2” x 2”, but must be large enough to convey attributes of the proposed product.
04 Provide each type of finished brick to be provided in quantities sufficient to show range of color where applicable.
05 Samples of brick ties proposed to be furnished.
06 Samples of full range of actual mortar color selections. Paper or digital samples are not acceptable.
07 Sample of mortar deflector proposed to be furnished.

G. Sample / Mock-Up Panel: Coordinate with Glazing Contractor and other trades as required to install security film on the glazed frame and glass component on the mock-up panel.
01 Film shall be 8 mil.
02 Include structural sealant joint at glass / frame intersection.

H. Verification Sample: two samples of film on glass representing the actual product, color and pattern.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
01 ANSI Z97.1 – Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test.

B. American Society for Testing Materials (ASTM):
01 ASTM C1499-09 – Monotonic Equibiaxial Flexural Strength of Glass (Double Ring Test).
02 ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
03 ASTM D1044 – Test Method for Resistance of Transparent Plastics to Surface Abrasion."
04 ASTM D3330 – Standard Test Methods for Peel-Adhesion at 180 Degree Angle".
05 ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.
06 ASTM E903 – Test Method for Solar Absorbance, Reflectance, and Transmittance of Materials Using Integrating Spheres"

C. Consumer Product Safety Commission (CPSC):
01 16 CFR 1201 – Safety Standard for Architectural Glazing Materials.

D. National Institute of Justice:
01 Standard, NIJ-STD-0108.01.

E. Code of Federal Regulations (CFR):
01 CFR Title 16 Part 1201 category I and II – Safety Standards for Architectural Glazing Materials

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products provided under this Section shall be provided by a manufacturer with a minimum of five (5) years of experience.
01 Engage a firm experienced in manufacturing systems similar to those indicated for this Project and meeting the standards of the International Standards Organization (ISO), ISO 9001 Quality Assurance in Production and Installation.

B. Installer Qualifications:

01 Engage an experienced installer certified, licensed, or otherwise qualified by film manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.
02 Manufacturer's installer shall have a minimum of five (5) years of experience in installing safety and security films.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.5 WARRANTY

A. Submit a written warranty, executed by the film manufacturer, agreeing to repair or replace defective safety and security film for a warranty period of minimum ten (10) years.

B. Failures include, but are not limited to:
01 Delamination, peeling, cracking, crazing.
02 Failure of the structural sealant.
03 Objectionable appearance / discoloration

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Safety and Security Films is based on products / systems provided by C-Bond Systems.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide safety and security films provided proposed products meet or exceed all specified requirements, and characteristics / attributes of the basis of design product(s).
01 3M
02 Request for substitutions will be considered in accordance with provisions of Section 01 60 00-Product Requirements

C. Design of structural sealant is based on products manufactured by Dow Corning 995 Silicone Structural Sealant.

D. Acceptable Manufacturers: The following manufacturers are acceptable to provide structural sealants provided proposed products meet or exceed all specified requirements, and characteristics / attributes of the basis of design product(s).
01 3M Impact Protection Adhesive (IPA): Weatherable, UV-resistant, moisture curable structural sealant wet glaze.
a. Black
b. White

2.2 FILM MATERIALS

A. Design of Safety and Security Films is based on 3M Scotchshield Ultra S800 Safety and Security Film.
01 The security film shall be a complete system, including film and continuous structural sealant at perimeter of glazing panel.
02 Safety Glazing – in accordance with the CPSC 1201 and the ANSI Z97.1 standards.

03 Minimum thickness of glass to be 1/4" inch (6 mm) annealed (non-tempered) monolithic or insulated units, utilizing the C-Bond technology, a patented, non-toxic, water-based, nano-technology.
04 Color: Clear

B. Performance Properties:
01 Thermal and Optical Performance Properties: Provide glazing films that will not affect the thermal and optical performance characteristics as established by the glass components scheduled for curtain wall, storefront and entrance glazing.
02 Flexural Glass Strength: When tested in accordance with ASTM C1499-09, Monotonic Equibiaxial Flexural Strength of Glass (Double Ring Test), the application of the mounting fluid/alone shall strengthen the glass to percentages up to and over 250 percent, and improve the flexure properties of the glass to percentages up to and over 130 percent.

C. Glazing Film Accessories:
01 General: Provide products complying with requirements of glazing film manufacturer for application indicated and with a proven record of compatibility with surfaces contacted in installation.
02 Adhesive: Types recommended by glazing film manufacturer and nano-technology fluid manufacturer.
03 Cleaners, Primers, and Sealers: Types recommended by glazing film manufacturer.

D. Film material shall be 8.0 mil and 15 mil film at specified locations specifically designed for glazing security applications.
01 Security film shall be installed full width at both doors and windows at the specified locations on the interior surface of the glass.
02 At each required location, film shall be installed from the nearest horizontal mullion at or above 7’-0” above finish floor to the bottom of the glazed panel
03 Film for exterior and interior glazing shall be clear.

E. Locations to receive 8 mil security film:
01 Interior operable windows at Reception counter.
02 Exterior glass door entry and adjacent glazing.

2.3 STRUCTURAL SEALANT MATERIALS

A. Design of Structural Sealant is based on 3M Silicone Structural Sealant.
01 3M Impact Protection Adhesive (IPA): Weather, UV-resistant, moisture curable structural sealant wet glaze.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT; ASTM C1184; SWRI validation.
01 Hardness, ASTM D2240: 38 – 39 points.
02 Volatile Organic Compound (VOC) Content: 16 g/L.
03 Ultimate Tensile, ASTM D412: 380 psi (2.2 MPa), at 21 day cure
04 Ultimate Elongation, ASTM D412: 640 psi at 21 day cure
05 Tear Strength, Die B (ASTM D624): 72 ppi
06 Color: As selected by Architect from manufacturer’s full line of not less than 3 colors.

C. Compatibility: Provide joint sealants and accessory materials that are compatible with one another, with joint substrates, and with materials in close proximity under use conditions, as demonstrated by sealant manufacturer by testing and related experience.

D. Structural Glazing Sealants: Comply with ASTM C1184 and other specified requirements for each liquid-applied structural glazing sealant where indicated.

E. A minimum bead of 1/2” (.50”) overlapping the exposed edge of the security film, and 1/2” (.50”) overlapping the window frame/glazing system shall be used on all installations.

F. Structural adhesive to be color matched whenever possible, as allowed by availability from structural sealant manufacturer. Color matched is described as matching the color of the existing glazing bead/gasket.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Do not begin until glazing work is complete.

B. Examine glazing work to determine suitability for safety and security film installation to commence. Notify Contractor of any discrepancies; and do not proceed until resolved.

3.2 PREPARATION

A. Verify all conditions at glazing framing material and follow sealant manufacturer’s specific instructions for preparation of frame material(s).
.

B. Comply with manufacturer’s written instructions for surface preparation.

C. Prepare surfaces using methods and materials recommended by the manufacturer for the specific installation.

D. Protect window frames and adjacent work from damage during installation.

3.3 FILM INSTALLATION

A. Install all safety and security film in strict accordance with the manufacturer’s installation instructions, standards and recommendations.

B. Rough-cut film to size slightly larger than glass panel it is to be applied to.

C. Remove protective backer from adhesive side of film.

D. Spray both the glass and adhesive side of film with the slip solution, comprised of baby shampoo or dishwashing liquid and water, to facilitate proper positioning of film on glass.

E. Apply film to glass and lightly spray film with slip solution.

F. Scribe film to glass / frame juncture and cut film to fully fit the glass pane; taking care to keep film flat on glass while cutting.

G. Squeegee from top to bottom of film and side-to-side removing slip solution between film and glass.
01 Apply another spray coat of slip solution and squeegee a second time.

H. Allow film installation to dry thoroughly; and to allow film to dry flat.

I. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.

01 If installed film does not meet this criteria, remove and replace with new film.

3.4 SEALANT INSTALLATION

A. Clean excess slip solution resulting from squeegee operation from glass and frame surfaces to receive structural sealant.

B. Apply continuous, removable paint tape to frame and glass surface at head, jambs and sill. Tape should be located 1/2" to 3/4" from the glass / frame juncture.

C. Apply structural sealant continuously at head, jambs, sill, stop or similar element terminating the glass.

D. Shape to an even beveled / fillet shape.

E. Remove paint tape to result in clean, continuous structural sealant bead bonding film to frame.

F. Allow structural sealant to cure a minimum of ten (10) days. Protect from damage as required.

3.5 CLEANING

A. Remove excess mounting fluid at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended by glazing film manufacturer.

C. Replace films that cannot be cleaned.

D. Clean installed film with approved cleaners only. Contact nano-technology manufacturer for approved cleaning fluids.

3.6 PROTECTION

A. Protect glass film from damage by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass.

B. Protect all glass film during and after installation from marring, blemishes, scratches and damage due to incidental adjacent work.

C. If damaged, make all necessary repairs or replacements in accordance with the manufacturer’s recommendations and as directed by the Architect.

END OF SECTION

SECTION 08 90 00

LOUVERS AND VENTS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide louvers and vents in exterior walls as indicated on the Drawings.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 05 41 00 – Structural Metal Stud Framing
   03 Section 07 25 00 – Weather Barrier
   04 Section 07 65 26 – Self-Adhering Sheet Flashing
   05 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. American Architectural Manufacturer's Association (AAMA):
   01 AAMA 605.2 – High Performance Organic Coatings on Architectural Extrusions and Panels.

B. Air Movement and Control Association (AMCA):
   01 AMCA 500 – Test Methods for Louvers, Dampers and Shutters.
   02 AMCA 511 – Certified Ratings Program for Air Control Devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of louvers and vents is based on products Ruskin.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements:
   01 Airstream Products
   02 All-Lite
   03 Construction Specialties, Inc.

2.2 MATERIALS

A. Design of louvers is based on Ruskin Model ELF375DX fixed blade louver.

B. Louver Materials and Fabrication:
   01 Performance Ratings: AMCA licensed.
   02 Size(s): As indicated on the Drawings.
   03 Frame:
      a. Material: Extruded aluminum, Alloy 6063-T5.
      b. Wall Thickness: 0.081 inch (2.1 mm), nominal.
      c. Depth: 4 inches (102 mm).
      d. Downspouts and caulking surfaces.
   04 Blades:
      a. Style: Drainable.
      b. Material: Extruded aluminum, Alloy 6063-T5.
      c. Wall Thickness: 0.081 inch (2.1 mm), nominal.
      d. Angle: 37.5 degrees.
      e. Centers: 5-3/32 inches (129 mm), nominal.
   05 Bird Screen:
      a. Material: Aluminum 1/2 inch mesh x 0.063 inch intercrimp.
      b. Frame: Removable, rewireable.
      c. Gutters: Drain gutter in head frame and each blade.
      d. Downspouts: Downspouts in jambs to drain water from louver for minimum water cascade from blade to blade.
      e. Vertical Supports: Hidden vertical supports to allow continuous line appearance up to 120 inches (3,048 mm).
      f. Sill: Steeply angled integral sill eliminating areas of standing or trapped moisture where mold or mildew may thrive and effect indoor air quality.
      g. Assembly: Factory assemble louver components. All welded construction.

C. Performance Data:
   01 Based on testing 48-inch x 48-inch size unit in accordance with AMCA 500.
   02 Free Area: 54 percent, nominal.
   03 Free Area Size: 8.58 square feet.
   04 Maximum Recommended Air Flow Thru Free Area: 873 feet per minute.
   05 Air Flow: 7,490 cubic feet per minute.
   06 Maximum Pressure Drop: 0.15 inches W.G.
   07 Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/m^2) of free area at an air flow of 873 feet per minute (266 m/min) free area velocity when tested for 15 minutes.

D. Design Load: Incorporate structural supports required to withstand wind load of 30 PSF.

E. Sub-Sill Flashing:
   01 All louvers shall be furnished with continuous sub-sill flashing, spanning the full width of the rough opening.
   02 Sub-sill flashing shall be minimum 0.065” aluminum with integral (turned up) end dams and back dams. Minimum height of dams shall be 1”.
   03 Open vertical joint at end dam / back dam junction shall be TIG welded continuous to form a seamless dam component directing any / all trapped water to outside of building.
   04 Finish of sub-sill flashing shall match louver finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate with Contractor and other trades as required for rough opening and blocking requirements for proper installation of louver and vent assemblies.

B. Confirm rough opening size and preparation are correct prior to start of installation.

3.2 INSTALLATION

A. Install work of this Section in strict accordance with manufacturer's printed instructions and final accepted submittals.

B. Louver sub-sill flashing shall be set in a full bed of sealant.

C. Coordinate to have all sides of louver and vents sealed continuous to adjacent materials.

D. For operable louvers and vents, completely test all functions to confirm all mechanical elements of the assembly are functioning correctly.

E. Provide continuous sealant at perimeter of frame after installation.

END OF SECTION

SECTION 09 21 13

PLASTER ASSEMBLIES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Exterior cement plaster.

C. Related Work:
   01 Section 05 41 00 – Structural Metal Stud Framing
   02 Section 05 50 00 – Metal Fabrications
   03 Section 09 91 00 – Painting and Re-Painting

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide elevations indicating layout of all proposed plaster joints.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.
   04 Upon selection of plaster finishes / colors by Architect, provide two (2) 12"x12" samples of each selected finish / color.

1.3 QUALITY ASSURANCE

A. ASTM International:
   01 ASTM A653 / A653M-13 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   02 ASTM A1064 / A1064M-14 – Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   03 ASTM C11-13 – Terminology Relating to Gypsum and Related Building Materials and Systems.
   04 ASTM C35 76 – Inorganic Aggregates for Use in Gypsum Plaster Type II.
   05 ASTM C91 / C91M-12 – Masonry Cement.
   06 ASTM C150 / C150M-12 – Portland Cement.
   07 ASTM C206-14 – Finishing Hydrated Lime.
   08 ASTM C207-06 – Hydrated Lime for Masonry Purposes.
   09 ASTM C260 / C260M-10a - Air Entraining Admixtures for Concrete.
   10 ASTM C847-14a – Metal Lath.
   11 ASTM C897-05 – Aggregate for Job-Mixed Portland Cement Based Plasters.
   12 ASTM C926-14a – Application of Portland Cement-Based Plaster.
   13 ASTM C932-06 – Surface-Applied Bonding Compounds for Exterior Plastering.
   14 ASTM C933-14 – Welded Wire Lath.
   15 ASTM C979 / C979M-10 – Pigments for Integrally Colored Concrete.
   16 ASTM C1002-14 – Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
   17 ASTM C1063-14d – Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
   18 ASTM E90-09 – Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   19 ASTM E119-14 – Test Methods for Fire Tests of Building Construction and Materials.
   20 ASTM E413-10 – Classification for Rating Sound Insulation.

B. Federal Specifications: Fed. Spec. SS-L-00351a, Type F.

C. Metal Lath Manufacturer's Association.

D. American Subcontractor's Association: ASA No. A42.4.

E. Texas Lathing and Plastering Contractor Association / Texas Bureau for Lath and Plaster.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.

B. Portland / Masonry Plaster:
   01 Holcim
   02 National Gypsum Co.
   03 TEIFS / ParexUSA
   04 TXI

C. Lath & Metal:
   01 Alabama Metal Industries Corp. (Amico).
   02 Bailey Metal Products Limited
   03 Bostwick Steel Lath Co.

04 Dietrich
05 Fry Reglet
06 Marino Industries
07 United States Gypsum Co.
08 Western Metal Lath Co.

D. Acrylic Finish Coat:
01 Dryvit
02 Finestone
03 R-Wall
04 Senergy
05 STO

2.2 MATERIALS

A. Cement Plaster:
01 Portland cement: comply with ASTM C150, Type I.
02 Sand: provide sand that meets ASTM C144 (Sharp Torpedo Type) finish coat graded per ASTM C842.
03 Water: potable.
04 Fiberglass Strands: 1/2 inch alkaline resistant

B. Finish Type:
01 Acrylic Finish Coat.

C. Plaster Framing / Furring:
01 Main Runner Channels. 1-1/2" cold rolled, hot dip galvanized channels or hat-sections; minimum 0.0538” bare steel thickness; minimum 33 KSI steel.
a. Comply with ASTM A653.
b. Nominal weight: 480 PMLF.
02 Lathing Channels. 3/4" cold rolled, hot dip galvanized channels or hat-sections; minimum 0.0538” bare steel thickness; minimum 33 KSI steel.
a. Comply with ASTM A653.
b. Nominal weight: 305 PMLF.

D. Metal Lath:
01 General: 3.4 lbs. per SY, hot-dipped galvanized.
02 Metal Lath on Metal Plaster Framing: Expanded type, diamond shape.
03 Metal Lath on Non-Dampproofed Solid Surfaces: Expanded type, diamond shape, self-furring.
04 Metal Lath on Dampproofed Solid Surfaces: Expanded type, diamond shape, self-furring; backed with a asphalt saturated Kraft paper (Federal Spec UU-B-790a, Type 1, Grade 2, Style 2).
05 Lath Tie Wire: minimum 18-gauge, cold drawn galvanized steel wire.
06 Lath Screws: #10 x 1-1/4”, self-tapping, Round Washer Head or Modified Truss Head, K-Lath lathing screws, zinc plated.
07 Power Actuated: 3/8” diameter shank, minimum 3/4" length power actuated fasteners; zinc plated.
08 Lath Staples: Minimum 14 gauge, 1-1/2” leg, ¾” crown staples; or approved equal.

E. Accessories:
01 Pure zinc alloy or 1063 T5 aluminum unless otherwise noted.
02 Casing Bead / Plaster Stop: Design is based on Amico No. X-66 Casing Bead, with 3” wings and grounds of depth of associated plaster.
03 Control Joint: Design is based on Amico No. XJ15 Griplock J Control Joint.
04 Expansion Joint: Design is based on Amico no. 40 plaster expansion joint, grounds of depth of associated plaster.

05 Corner Bead / Key: Design is based on Fry Reglet No. PCM-75-75-150.
06 Soffit Vent: Design is based on Fry Reglet No. DS-875-V-200 or WPM-75-V-200; 2” reveal, vented soffit molding. Shape as applicable to application condition.
07 Interior Corner Reinforcement. 2" x 2" or corner master #30 USG Self- Edge Cornerite, or Cornermaster #30.
08 Drip Screed. Fry Reglet Corp., aluminum drip screed DS-875.

F. Fasteners:
01 Wire shall be galvanized annealed steel wire, in 18 gauge or 16 gauge as appropriate for use and shall comply with Federal Spec FSQQ-W-461g.AS.
02 Screws: Wafer head lathers Type S with length that penetrates steel substrate a minimum of 3/8”. Comply with ASTM C1002 and / or ASTM C954.
03 Nails: Galvanized 11 gauge with a 3/8” diameter head and length to penetrate wood framing a minimum of 3/4". Comply with Federal Spec FF-N-105.

2.3 MIXES

A. Portland Cement Plaster:
01 Scratch Coat – Mix Proportions:
a. 1 sack Portland cement (94 lbs.).
b. 2 sacks masonry mix.
c. 9 cu. ft. sharp torpedo plaster sand.
d. 1-1/2 lbs. of 1/2" alkaline resistant fiberglass strands.
02 Brown Coat – Mix Proportions:
a. 1 sack Portland cement (94 lbs.).
b. 2 sacks masonry mix.
c. 9 cu. ft. sharp torpedo plaster sand.
d. 1-1/2 lbs. of 1/2" alkaline resistant fiberglass strands.
e. Liquid or powdered waterproofing used according to the manufacturer's recommendations.
03 Acrylic Finish Coat: Factory mixed 100% pure acrylic based integral color.

B. Gypsum Plaster:
01 Base coat lath, one part plaster to two parts sand by weight.
02 Brown coat, one part plaster to three parts sand by weight.
03 Finish coat, one part plaster to two parts sand.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cold Weather:
01 Do not use frozen material.
02 Do not apply cement plaster to frozen surfaces or surfaces containing frost.
03 Do not mix materials or apply cement plaster when ambient temperature is less than 35°F/1.6°C.
04 A temperature of at least 55°F must be maintained prior to plaster application, during its application, and until it is dry. Any plaster work, which freezes within 48 hours of application, shall be removed and replaced with new plaster.

B. Hot Weather:
01 Protect cement plaster from uneven and excessive evaporation during hot, windy, and dry weather.
02 Moist curing after each coat of cement plaster with water if ambient temperature is more than 75°F/24°C. Moist cure for 48 hours after application of coats.
03 Hot, or dry, or windy weather the cement plaster should be moistened down and then covered with a single sheet of polyethylene plastic (clear only).

04 Moist curing is required at the start and end of workday.
05 Humidity higher than 75 percent. Moist curing not required.

C. Remove rust, oil, grease or other foreign substance which might hinder good bond from lath immediately prior to application of plaster.

D. Commencing work shall be construed as acceptance of preceding work performed by others as suitable to receive work specified in this division.

E. Erect and maintain scaffolding in accordance with all applicable laws and regulations, local or other.

F. Manufactured products shall be delivered in original packages, containers or bundles, bearing manufacturer's name and brand.

G. Mix in accordance with manufacturer's direction. Protect mixes from frost, dust and evaporation. Clean mixers, boxes and tools after each batch.

H. Mix thoroughly with correct amount of water until uniform color consistency. Measure materials accurately.

I. Mix materials dry to uniform color and consistency before adding water.

J. Mix only as much plaster as can be used in one hour.

K. Do not re-temper mixes after initial set has occurred.

L. Do not apply finish coat when there is any form of precipitation. Protect cement plaster from all forms of precipitation during the application and the setting/curing period of finish coat. Ensure that the finish is fully set prior to removing protective covering.

3.2 APPLICATION

A. Furring and Soffit Framing:
01 Main runner channels (1-1/2") and lath channels (3/4") shall be spaced at 4'-0" O.C. and 16” O.C. respectively.
02 The use of 16-gauge galvanized metal studs (3-5/8" wide) may be used as miscellaneous framing to achieve soffit geometry as approved by the Architect.
03 All galvanized hanger wires shall be spaced at 4'- 0" O.C. maximum. Do not use power actuated anchors through metal deck for wire supports.
04 Prepare all framing to receive recessed lights and control joints.
05 Exterior soffit locations provide 1-1/2” cold rolled channel stiffeners secured to grid and structure above, space 8 ft., each way.

B. Metal Lath on Plaster Framing:
01 Secure lath to channels by tying securely with two loops of 18 or 16-gauge tie-wire at 6" O.C. spacing maximum.
02 Lap metal lath a minimum of 2” over supports.
03 Apply lath with long dimension of sheet across supports.
04 All lath shall be tightly stretched, free from looseness, bags, and bulges.

C. Metal Lath on Dampproofed Sheathing:
01 Secure lath with screws into metal studs through sheathing. Screw lath to studs at maximum 8” O.C.
02 Lap metal lath a minimum of 2” over stud supports.
03 Apply lath with long dimension of sheet across supports.
04 All lath shall be tightly stretched, free from looseness, bags, and bulges. Use additional staples as required to assure lath is flat and flush.

D. Metal Corner Beads:
   01 Provide on all external plaster corners in single lengths where length of the corner does not exceed 12 feet.
   02 Fasten securely with tie wire spaced 8" O.C. staggered in two wings.

E. Casing Beads:
   01 Install at edges of all horizontal planes and elsewhere as indicated on drawings.
   02 All junctions shall be mitered.
   03 Horizontal surfaces shall be isolated from all vertical surfaces.

F. Control Joints:
   01 It is not required to cut lath behind control points, it is required to cut lath behind expansion joints.
   02 Panels should be relatively square.
   03 Notify architect if plaster areas exceed 12 LF in length without a control joint.
   04 Install control joints for surface areas of approximately 150 square feet whether shown or not. Verify locations with Architect.
   05 Install where dissimilar back-up materials join whether detailed or not.

G. Soffit Vent Molding:
   01 Install soffit vent molding, continuous on three sides of horizontal plaster installations.
   02 Verify substrate for vent attachment and provide the appropriate type fastener for the application.

H. Portland Cement Plaster:
   01 Trowel apply base coat with sufficient force to form good keys and bond. Allow to harden and scratch to produce rough surface. Keep moist until application of brown coat.
   02 Apply brown coat, scratch for bond and allow to set hard. Keep moist until application of finish coat.
   03 Use in all exterior locations and interior locations where noted.

I. Finish Coat:
   01 Acrylic finish at all plaster areas. Mix and apply in accordance with manufacturer's written instructions. No scaffold lines or other marks are allowed due to the application. Match colors and textures of approved samples.

3.3 CLEAN UP AND PROTECTION

A. Rubbish and debris shall be removed as often as necessary. As each room or space is complete, remove all rubbish, debris, scaffolding and tools, and leave broom clean.

B. Clean plaster spots from work of other trades. Protect finish plaster from injury.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Interior metal framing – studs, joists and similar required framing.
   02 Interior gypsum board at walls, including trim, taping and floating.
   03 Interior gypsum board at ceilings, including trim, taping and floating.
   04 Interior glass-mat backer board at ceramic tile and masonry wall finishes.
   05 Exterior sheathing.

C. Related Work:
   01 Section 05 41 00 – Structural Metal Stud Framing
   02 Section 05 50 00 – Metal Fabrications
   03 Section 06 10 00 – Rough Carpentry
   04 Section 07 21 00 – Thermal Insulation
   05 Section 07 25 00 – Weather Barrier
   06 Section 07 84 13 – Penetration Firestopping
   07 Section 09 51 13 – Acoustical Tile Ceilings
   08 Section 09 91 00 – Painting and Re-Painting

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Where proposed framing solutions exceed specified maximum allowable unbraced heights, submit engineered calculations for each specific condition; sealed and signed by a Texas licensed structural engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   01 ASTM C473 – Standard Test Methods for Physical Testing of Gypsum Panel Products.
   02 ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
   03 ASTM A653 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by Hot-Dip Process.
   04 ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
   05 ASTM C954-10 – Standard Specifications for Steel Drill Screws for the Application of Gypsum Panel Products to Steel Studs.
   06 ASTM C1002–07 – Standard Specifications for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products to Steel Studs.
   07 ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
   08 ASTM C1178 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
   09 ASTM C1280 – Standard Specification for Application of Gypsum Sheathing.
   10 ASTM C1396 – Standard Specification for Gypsum Board.
   11 D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
   12 ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

B. Gypsum Association:
   01 GA-214 – Recommended Levels of Gypsum Board Finish.
   02 GA-216 – Application and Finishing of Gypsum Panel Products.
   03 GA-253 – Application of Gypsum Sheathing.
   04 GA-290 – Area Separation Walls.
   05 GA-600 – Fire Resistance Design Manual.

C. National Fire Protection Association:
   01 NFPA 285 – Standard Fire Test Methods for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Materials.

1.4 DESIGN REQUIREMENTS

A. Non-Load-Bearing Metal Framing Deflection:
   01 L/360 at 5 PSF for veneer plaster and direct-applied finish materials that use grout or mortar.
   02 L/240 at 5 PSF for typical gypsum board walls.

B. Fire-Resistive Rating: Where indicated on Drawings, provide materials and construction that are identical to those assemblies whose fire resistance rating has been determined per ASTM E119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

C. Meet or exceed fire resistance requirements outlined under provisions of the GA-600 Fire Resistance Design Manual for wall and ceiling assemblies.

D. Meet or exceed Class A flame/fuel/smoke requirements of ASTM E84 surface burning characteristics for finish materials.

E. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.

F. Impact-Resistant Characteristics: No structural failure at 400 foot pounds per ASTM E195.

G. Mold-Resistant Characteristics: Rating of 10 according to ASTM D3273 mold testing.

H. Recycled Content Certification: Provide gypsum board of at least 95 percent recycled content.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep 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 board to prevent damage to edges, ends, and surfaces. Do not bend or damage metal corner beads and trim.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design of metal stud drywall framing, and similar components is based on products manufactured by ClarkDietrich.

B. The following additional metal stud framing manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Cemco
   02 Marino/Ware
   03 Mill Steel
   04 The Steel Network
   05 Telling Industries

C. Gypsum Wall Board: Provide domestically manufactured gypsum wall board.
   01 American Gypsum
   02 Georgia Pacific
   03 James Hardie Industries
   04 National Gypsum Company
   05 Temple–Inland Forest Products Corp.
   06 U. S. Gypsum Co.

D. Exterior Sheathing:
   01 Georgia Pacific, “Dens Glass Gold” – basis of design.
   02 National Gypsum, Gold Bond “eXP” Extended Exposure Sheathing
   03 Temple-Inland Forest Products Corp. “Green Glass”
   04 U.S. Gypsum “Securock”

E. Glass-Mat Backer Board:
   01 USG Durock – basis of design.
   02 Certainteed
   03 James Hardie Industries

F. Substitutions of above must be approved by the Architect ten (10) days prior to Proposal / Bid Date.

2.2 STUD FRAMING MATERIALS

A. The Drawings indicate locations of partitions / stud framing and the size of the stud to be used. The Contractor is responsible for providing the appropriate stud mil thickness relative to the height and configuration of the assembly.
   01 The minimum thickness for all interior framing materials shall be 33 mils.
   02 Physical features of materials proposed to be furnished shall meet or exceed all requirements outlined below.

B. All metal framing members shall be channel type, screw type studs and runners, punched cee studs.
   01 33 mil and 43 mil material fabricated from steel with minimum 33 KSI yield strength.
   02 54 mil and heavier materials fabricated from steel with minimum 50 KSI yield strength.
   03 Conforming to ASTM C645 Standard Specification for Non-Structural Steel Framing Members.
   04 Minimum G-40 galvanized steel – ASTM A653. Galvannealed material is not acceptable. Coating equivalents are not acceptable.
   05 Provide in sizes as indicated on the Drawings and required for the actual installation assembly.

C. Interior partition and similar metal framing is based on three (3) primary stud thicknesses. The following is the minimum Mil thicknesses for studs:
   01 33 Mils minimum stud thickness to be provided at any location; unless indicated otherwise on the Drawings or required to be heavier by Specification or unbraced assembly height as determined by the installer.
   02 43 Mils (18 Gauge).
   03 54 Mils (16 Gauge).
   04 68 Mils (14 Gauge).

D. Mil thicknesses of studs shall be based on 16” O.C. framing with the maximum, laterally unbraced height at each condition in accordance with the following schedule based on gypsum board applications:
   01 5 PSF at L/240 conditions; standard gyp board drywall partitions to receive a painted or vinyl wall covering finish.

Stud Size	Height 33 Mils	Height 43 Mils	Height 54 Mils	Height 68 Mils
2-1/2”	13’-10”	N/A	N/A	N/A
3-5/8”	16’-9”	18’-3”	19’-6”	20’-10”
6”	24’-9”	27’-2”	29’-2”	31’-3”

   02 5 PSF at L/360 conditions; gyp board drywall partitions to receive a finish material utilizing grout, mortar or plaster.

Stud Size	Height 33 Mils	Height 43 Mils	Height 54 Mils	Height 68 Mils
2-1/2”	11’-8”	N/A	N/A	N/A
3-5/8”	14’-8”	15’-11”	17’-1”	18’-3”
6”	21’-8”	23’-9”	25’-6”	27’-3”

03 Where heights exceed limits stated above, framing at less than 16" O.C. or use of heavier mil thicknesses shall be allowed, conditional on submittal of engineered calculations for each specific condition; sealed and signed by a Texas Licensed Structural Engineer.

E. The gross Section Modulus (Sx) value for interior metal framing members shall be minimum:

Member Size	33 Mil Sx	43 Mil Sx	54 Mil Sx	68 Mil Sx
2-1/2"	0.180	0.238	0.288	0.355
3-5/8"	0.258	0.334	0.410	0.503
6"	0.520	0.675	0.832	1.026

F. All above material mil thicknesses, performance criteria and related values are minimum requirements.
01 Under NO circumstances shall any stud product less than 33 mils be acceptable.
02 Gauge equivalent / dimpled and similar products whose base materials do not meet the above criteria, performance and properties shall not be accepted under any circumstances.
03 The "ProSTUD 33" series as manufactured by ClarkDietrich meets all criteria and is acceptable. Track sections from the ProSTUD 33 system are acceptable.
04 The "ViperStud 20 STR 33 mil" series as manufactured by Marino Ware meets all criteria and is acceptable. Track sections from the ViperStud 20 STR 33 mil system are acceptable.

G. Stud tracks shall be provided in the same mil thickness or heavier than the studs they are associated with.
01 Stud sill / floor track leg height shall be minimum 1-1/4".
02 Head tracks which anchor to structural steel or floor / roof deck shall have a minimum 2" leg height (deep track) and be fabricated and installed to allow movement and flexibility of studs nested within the track.

H. Studs at all framed door and window openings shall be installed with full-height (floor to top of wall), double studs at jambs.
01 Double studs at opening shall be clipped / fastened together to result in a single composite assembly.
02 Coordinate with other trades where additional miscellaneous steel bracing is required.
03 Framed openings for mechanical ductwork and similar work shall be framed as required for the assembly.
04 Fastening studs directly to ductwork is not permitted. Coordinate with other trades as required. Adhere to U.L. requirements at fire rated partitions.

I. Metal framed partitions scheduled to receive tile finish or other applied finishes containing mortar or grout shall be increased to the next higher mil thickness for the height designated above.
01 Examples: 33 mil increased to 54 mil; 54 mil increased to 68 mil.
02 No increase is required for 68 mil framing.
03 Contractor's option: stud framing size / mils based on height limitations per above may be installed at 8" O.C. in lieu of the stated increase in mil thickness.

J. Structural metal stud bracing is required at each door opening 48" or wider.
01 Provide two (2) 54 mil studs at each jamb of frame.
02 Studs shall be fastened together to form a single composite unit.
03 Studs shall extend and be secured to steel structure above.
04 Field verify conditions and requirements.

K. Horizontal Bracing: shall be minimum 54 Mil cold rolled channels with 1/2" legs. Provide in sizes in accordance with punched openings in studs.
   01 Horizontal bracing shall be either welded in place to each stud; or fastened with a clip specifically designed for the purpose.
   02 Provide one row of horizontal bracing at mid-span of partitions up to 12'-0" high; and at 5'-0" O.C. for partitions higher than 12'-0".

L. Provide all accessories including, but not limited to, tracks, clips, web stiffeners, spacers, anchors, fastening devices, resilient clips, and other accessories required for a complete and proper installation, and as recommended by the manufacturer for the steel member and assembly being used.

M. Ceiling Framing:
   01 U-Channel Framing: Minimum 1-1/2" x 54 mil cold rolled steel channels with hot dip galvanized finish. Use for primary framing at suspended ceilings and elsewhere as indicated.
   02 Furring Channels: Standard 2-3/4" wide, 7/8" deep x 30 mil minimum galvanized sheet metal furring channels.
   03 Ceiling Hanger and Tie Wire: 9 gauge galvanized hanger wire and 16 gauge tie wire.
   04 Fixture Reinforcement: 6 inch, 14 gauge / 68 mil cold rolled steel galvanized channels.

N. Wall Furring:
   01 Furring Channels: standard 1-1/2" and / or 7/8" deep x 30 mil minimum galvanized sheet metal 'hat section' furring channels.
   02 Refer to Drawings for size at each application.

O. Metal to Metal Connections:
   01 Framing fasteners shall be self-drilling / self-tapping screws.
   02 Framing screws shall be #10-16x5/8" hex washer head screw.
   03 Welded connections shall be fillet or flare welds as recommended by the manufacturer for the specific connection conditions.

2.3 WALL AND CEILING BOARD MATERIALS

A. General Design Basis: All gypsum wallboard shall be USG 5/8 inch thick, Type X, tapered-edged. Sizes shall be 4'-0" wide by longest practical length to minimize joints.
   01 Suitable for use in fire rated assemblies.

B. Humidity Resistant Gypsum Wallboard shall be USG 5/8", Type X, Sheetrock "Mold Tough" gypsum panels.
   01 Panels shall comply with ASTM D3273.
   02 Use at all walls and ceilings in high humidity rooms (locker rooms, shower rooms / stalls, food service areas / rooms, restrooms, non-air-conditioned interior spaces / rooms) that do not receive a tile or masonry finish.
   03 Also provide within 24" of all sinks and lavatories.

C. Tile or Masonry Finish Substrate: A cement-based backer board manufactured specifically for tile substrate and use in wet locations. Use as wall board substrate at all tile or masonry finished surfaces.
   01 Minimum 5/8 inch thick.
   02 Provide / install in greatest size sheets possible (48" x 96" or larger) to minimize joints.
   03 Use joint reinforcement and fasteners in accordance with manufacturer's printed instructions.

D. Acceptable manufacturers / products include:
   01 USG “Durock” (basis of design).
   02 James Hardie Industries “HardieBacker”.
   03 National Gypsum “Permabase”.

E. Corner Beads: Design is based on USG Dur-A-Bead Corner Bead
   01 Complies with ASTM C1047
   02 1-1/4” legs.
   03 Material Thickness: 0.012” minimum
   04 Use at all exterior corners.

F. Joint Compound (Taping): Standard types manufactured by gypsum wallboard manufacturer for intended use. Fire rated type must be used on fireproof systems.

G. Laminating Adhesives: Standard type manufactured or recommended by manufacturer of product to be laminated.

H. Gypsum board reveals shall be 1/2” wide by 5/8” deep drywall reveals; extruded aluminum, painted finish.
   01 Provide where indicated on the Drawings.
   02 Acceptable manufacturers / products include:
      a. Gordon ‘Final Forms I’ Series 500 (basis of design).
      b. Fry Reglet -. “DRM” Series.
      c. Pittcon - “SWR” Series.

I. Control Joints: Metal type with 1/4 inch open joint, perforated flanges for floating in place.
   01 Niles Building Products model 093 Zinc Control Joint; or equal.
   02 Control joints at walls shall be located vertically.
      a. A maximum of 30'-0" O.C. floor to above ceiling.
      b. Each side of door frames from top of jamb to above ceiling.
      c. Above ceiling, cut / separate gyp board full height to top of gyp board.
   03 Control joints at gypsum board ceilings shall be located:
      a. As indicated on the Drawings
      b. Where not indicated, at a maximum of 30’-0” O.C. Coordinate with Architect for exact locations.
   04 Control joints at furdowns shall be located on all sides of the furdown at a maximum of 30'-0" O.C. to above ceiling.
   05 At building expansion joints, provide control joint full height of gyp board unless detailed or specified otherwise.

J. Exterior Sheathing:
   01 Mold-resistant, fire-rated glass-mat gypsum sheathing board.
   02 Thickness: 5/8 inch (16 mm).
   03 Properties: Enhanced mold resistance per ASTM D3273. Glass facers on both sides.
   04 Water absorption less than 6 percent per ASTM C473.
   05 Configuration: Forty-eight inches (1219 mm) wide by length required with square edges for horizontal application.

K. Fasteners (screws) shall be U.S.G. type “S” drywall screws, minimum 1-1/4” length, or longer as required to penetrate metal framing components a minimum of 1/2".

2.4 GLASS-MAT BACKER BOARD

A. Design of glass-matt backer board is based on USG Durock Tile Backerboard.

B. Treated water-resistant gypsum core that is covered with a coated fiberglass mat-facer and cementitious surface, specifically designed for use as a substrate for direct applied tile of masonry.

C. Properties:
   01 Thickness: 5/8".
   02 Size: 48" x 96".
   03 Mold Resistance: 10 maximum per ASTM D3273.

D. Fasteners: Design is based on USG Durock Tile Backer Screws.
   01 Length: 1-5/8".
   02 Corrosion resistant screws complying with ASTM B117.
   03 Specifically designed for attachment of glass-mat backer board.

PART 3 - EXECUTION

3.1 METAL FRAMING INSTALLATION

A. Floor Track: Attach to floor at 24 inch maximum centers with shoot-in pins or concrete nails.

B. All metal framing shall extend to floor or roof structure / deck above, unless shown otherwise on the Drawings.
   01 Fasten tracks at 24" intervals and more often where necessary.
   02 Where framing is perpendicular to joists, provide additional bracing as required.
   03 At fire rated partitions, framing shall extend full height to floor or roof deck above to allow a full, tight fit and seal of gyp board to be applied.
   04 Where studs are indicated to extend only above ceiling, brace to structure or other suitable framing at intervals not to exceed 32" O.C. each side and staggered. Framing used for bracing shall be minimum 33 Mil members.

C. Studs:
   01 Single lengths positioned vertically in the runners, spaced 16 inches O.C. maximum unless otherwise shown.
   02 Install double studs at framed opening jambs. Install stud bracing on each side of opening at frame head height between jamb studs and adjacent studs.
   03 Secure studs to stud track on both sides at bottom track prior to installation of gyp board.
   04 Where framing extends to structure or floor / roof deck, secure studs to both sides at bottom track with stud lengths no less than 3/8" (within 1/8"+/- tolerance) gap at top track, prior to installation of gyp board. Temporarily fasten top track to stud as required to hold plumb in place. Secure / fasten gyp board to studs +/- 1" below bottom of track leg. Do not permanently fasten gyp board or stud directly to top track. Remove temporary track fastener to provide vertical movement of studs within the top track.
   05 Where studs are indicated to extend only above ceiling, secure studs to both sides at top and bottom track prior to installation of gyp board. Brace to structure or other suitable framing at intervals not to exceed 32" O.C. one side only. Coordinate with other trades as required to avoid conflict.

D. Wall Reinforcement:
   01 Provide horizontal bridging in all stud walls in accordance with the manufacturer's standards and recommendations.

02 Provide solid, 2x (2x4 min.) treated wood blocking, spanning between wall studs, at all wall mounted fixtures, finish hardware, toilet partitions, wall cabinets, toilet accessories, specialties, built-in work and similar locations as required to provide a suitable substrate for firm attachment of other work.

E. Chase-Wall Bracing:
01 Install cross-bracing for chase wall construction; Mil thickness of bracing to equal stud Mil thickness.
02 Space braces a maximum of 36 inches vertically on every pair of studs.

3.2 WALLBOARD INSTALLATION

A. Select the maximum practical length to minimize end joints. All end joints shall be neatly fitted and staggered. Joints on opposite sides of partition shall be so arranged as to occur on different studs.

B. Install metal corner bead at external corners. Where length of the corner does not exceed standard stock lengths, use a single length.

C. Install gypsum board moisture guard on the bottom of all gypsum board sheets set at / on finish floor slabs.

D. Install metal trim where indicated and all wall board not terminating under frames or behind bases shall be trimmed with galvanized "J" mold.

E. Apply at least three coats of joint compound over beads, screw heads and trim, and each coat shall be feathered out onto panel faces. Refer to Paragraph 3.8 Workmanship Tolerances for level of finish required.

F. Float out and sand joints to make joints invisible when painted with non-texture paint. Refer to Paragraph 3.8 Workmanship Tolerances for level of finish required.

G. Caulk around pipes, ducts, structure or similar items which penetrate drywall systems.

H. Fasten wallboard at 12 inches O.C., except at the edges/joints which shall be at 8 inches O.C.

I. Edge-Grip Clips: Position clips on the back of the panels and drive prongs into panel edges. Space clips 16 inches O.C. Screw-attach clip to framing, furring or wall surface.

J. At all wrap-around hollow metal frames, gyp board shall extend ½” minimum into frame throat.

K. At all exterior metal framed walls extend gypsum wall board from floor to deck unless noted otherwise.

3.3 SHEATHING INSTALLATION

A. Install sheathing in accordance with manufacturer’s instructions and applicable instructions in Gypsum Association -253 and ASTM 1280.

B. Install using maximum lengths possible to minimize the number of joints.

C. Secure sheathing to metal framing with hot dip galvanized screws spaced 8 inches O.C. at perimeter of board and 12” O.C. in field of board. Do not countersink fasteners; drive them to bear flush with surface of sheathing. Locate fasteners at least 3/8” from edges.

D. Provide sheathing at all exterior metal framed walls unless noted otherwise. Install with all joints tight.

E. Accurately cut and scribe at interfacing / penetrating work.

F. Coordinate with the installation of dampproofing above grade. Refer to Section 07 11 13 – Bituminous Dampproofing.

3.4 GLASS-MATT BACKER BOARD

A. Install glass-mat backer board at all interior wall surfaces to receive direct applied ceramic or similar tile, plaster and thin-set masonry.

B. Install in full size sheets as much as possible to minimize joints.
   01 Install backer board with ends and edges closely abutted but not forced together.
   02 Stagger end joints in successive courses.

C. Fastening:
   01 For wall application, fasten glass-mat backer board to framing with specified fasteners.
   02 Drive fasteners into field of panels first, working toward ends and edges.
   03 Hold panels in firm contact with framing while driving fasteners.
   04 Space fasteners maximum 8" O.C. with perimeter fasteners at least 3/8" and less than 5/8" from ends and edges.
   05 Drive screws so bottoms of heads are flush with panel surface.
   06 Do not overdrive fasteners.

3.5 CEILING FRAMING INSTALLATION

A. Main Runners: Hanger wires (9 gauge) shall be spaced not over 4'-0" in the direction of 1-1/2 inch main runner channels, not over 4'-0" in the direction of right angles to the main runners, and within 6 inches of the ends of main runners and of boundary walls, girders or similar interruptions of ceiling continuity.
   01 Do not place over 4’-0" O.C., properly positioned and leveled.
   02 Suspension of ceiling framing from joist bridging is not permitted.

B. Furring Channels: Space 16 inches O.C., and saddle-tie with two strands of 16 gauge tie wire to main runners or main support members.
   01 Do not let into or come in contact with abutting masonry walls.
   02 End splices shall be provided by nesting channels or studs no less than 8 inches and securely wire-tie.

3.6 CEILING BOARD INSTALLATION

A. Apply gypsum board of maximum practical length with the long dimension at right angles to the furring channel and fastened with 1 inch drywall screws spaced 12 inches O.C. in the field of the board and along abutting ends.

B. Align abutting end or edge joints over the web surface of the furring channel. Tie neatly and accurately with end joints staggered.

3.7 WORKMANSHIP TOLERANCES and REQUIRED LEVEL OF FINISH

A. Wallboard:

01 Visual: Correct any nicks, bumps, out-of-level or out-of-plumb areas detectable to the naked eye.

02 Float solid between corner beads less than 36 inches apart. Surfaces that appear concave are not acceptable.

03 Provide "J" mold and continuous 1/4 inch reveal wherever gypsum board directly abuts other material or when the end is exposed.

04 Float control joints flush with the wall surface so that ceiling wall molds that are specified separately will align flat and straight with the wall surface.

B. Required Level of Gypsum Drywall Finish (refer to Gypsum Association publications for standards):

01 All gypsum wallboard shall be finished to a level 4 unless specifically scheduled or noted otherwise. All joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over all flat joints and 1 separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with 3 separate coats of joint compound. All joint compounds shall be smooth and free of tool marks and ridges.

02 For all plenum areas and areas not exposed provide a level 1 finish. All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

03 All gypsum wallboard scheduled to receive a semi-gloss or glossy finish shall be finished to a level 5 unless specifically scheduled or noted otherwise. All joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over all flat joints and 1 separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with 3 separate coats of joint compound. A thin coat of joint compound or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.

3.8 COMMENCEMENT RESTRICTIONS

A. Interior gypsum wallboard and ceiling board installation may not commence until all exterior sheathing and dampproofing is completed, the individual floor is dried in or roofing is complete, roof top equipment openings are covered and flashed, and exterior wall openings are protected.

3.9 PROTECTION AND CLEAN UP

A. Coordinate with painting and make sure all gypsum board is primed and the specified texture is provided.

B. Unless the Construction Manager gives notice otherwise, in advance. Each Trade Contractor is responsible for removing his own trash from the work area and for the initial cleaning of his own work, while ongoing and when completed.

01 Garbage collections: Provide a collection can at each location on the site used as an eating area.

02 Trash removal: Clear the building and site of trash at least once a week. When rapid accumulation occurs, make more frequent removal. Remove highly combustible trash such a paper and cardboard daily.

03 Disposition of debris: Remove debris from the site and make legal disposition. Locations for disposal shall be of the Contractor’s choice within the above restrictions. No debris or material may be buried or burned at the site. Take necessary precautions to prevent accidental burning of materials be avoiding large accumulations of combustible materials.

C. The Work shall be turned over to the Construction Manager/Owner in immaculate condition. Cleaning includes removal of smudges, marks, stains, fingerprints, soil, dirt, paint spots, dust, lint, discolorations and other foreign material.

D. Remove all temporary facilities.

END OF SECTION

SECTION 09 30 13

CERAMIC TILING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all floor tile products / work as indicated on the Drawings and required for a complete installation.
   02 Provide all wall tile products / work as indicated on the Drawings and required for a complete installation.
   03 Provide other tile products / work at other locations as indicated on the Drawings and required for a complete installation.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 07 92 00 – Joint Sealants
   03 Section 09 21 13 – Gypsum Board Assemblies
   04 Section 09 30 16 – Quarry Tiling
   05 Refer to other Division 09 Flooring Specifications as required to assure proper coordination and interface at applicable locations.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
01 Provide two (2) samples of each finish for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.
04 Composite Sample: Submit samples of selected tile and grout mounted on a minimum 12" x 12" board, or larger if necessary, indicating tile pattern / installation, joint size and grout color.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American National Standards Institute:
01 ANSI A108.1 – Installation of Ceramic Tile with Portland Cement Mortar.
02 ANSI A108.4 – Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive.
03 ANSI A108.5 – Ceramic Tile installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
04 ANSI/TCA A 108.6 – Ceramic Tile installed with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
05 ANSI A108.10 – Grout Installation.
06 ANSI A118.1 – Dry-Set Portland Cement Mortar.
07 ANSI A118.4 – Latex Portland Cement Mortar.
08 ANSI A118.6 – Specifications for Ceramic Tile Grout.
09 ANSI A136.1 – Organic Adhesives for Installation of Ceramic Tile, Type 1 and Type 2.
10 ANSI A137.1 – Specifications for Ceramic Tile.

B. Tile Council of North America (TCNA):
01 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation (latest edition).

1.4 WARRANTY

A. The tile installation, including tile products, mortar adhesives and grout, shall be complete system as recommended by the manufacturer for the specific installation.

B. Provide a complete systems warranty, issued by the tile setting manufacturer that will cover the entire tile installation system against defects for a minimum ten (10) years.

PART 2 - PRODUCTS

2.1 CERAMIC TILE MANUFACTURERS

A. Design of ceramic tiling is based on products manufactured by Trinity Tile.
01 Ceramic tiling is based on specific products, finishes and colors as identified on the Drawings.
02 Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings. Refer to section 01 25 00.

B. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
   01 Dal-Tile
   02 American Olean Tile Co.
   03 Crossville
   04 Florida Tile Industries, Inc.
   05 Interceramic Tile and Stone Gallery
   06 Texas Cement Products
   07 U.S. Ceramic Tile Co.

2.2 CERAMIC TILE MATERIALS

A. General Requirements and Characteristics
   01 Ceramic tiling is based on Trinity Tile Decocer series glazed ceramic tile with cushion edges.
   02 Size: 4" x 12"
   03 Provide ceramic tile accents and patterns as indicated on the Drawings.
   04 Shapes: Provide cove wall tile base, and necessary trim shapes to terminate tile with a bullnose edge at top of partial wall height installations and rounded external corners.
   05 Provide square internal vertical corners and ceiling wall joints.

2.3 POCELAIN TILE MANUFACTURERS

A. Design of Porcelain Tile is based on products manufactured by Crossville.
   01 Porcelain tiling is based on specific products, finishes and colors as identified on the Drawings.
   02 Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings. Refer to section 01 25 00.

B. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
   01 Trinity Tile
   02 American Olean Tile Co.
   03 Florida Tile Industries, Inc.
   04 Interceramic Tile and Stone Gallery
   05 Texas Cement Products
   06 U.S. Ceramic Tile Co.

2.4 PORCELAIN TILE MATERIALS

A. General Requirements and Characteristics
   01 Porcelain tiling is based on Crossville Theoretical series, Portfolio series and Theoretical Bold series porcelain tile.
   02 Color body porcelain tile.
   03 Sizes: as indicated on the Drawings.
   04 Dynamic Coefficient of Frictions > 0.42.
   05 Patterns shall consist of borders and other patterns as indicated on Drawings.
   06 Provide coved tile base where indicated on the Drawings.
   07 At top of all porcelain tile walls not extending to ceiling, tile shall have “glazed over” edge terminated with a bullnose edge tile.

2.5 TILE SETTING MATERIALS

A. Mortar adhesive and grout products shall be furnished by a single manufacturer; and as a system shall be eligible to provide a system warranty.

B. Acceptable Manufacturers:
   01 Ardex
   02 Cemix / Texrite
   03 Custom Building Products
   04 Laticrete
   05 Mapei Americas
   06 Southern Grouts and Mortars

C. Cement Adhesives:
   01 Polymer / latex modified, Portland cement based mortar formulated for thin-set tile applications.
   02 In accordance with ANSI A118.15.
   03 Provide in pre-mixed bags / containers that require only the addition of water.
   04 Specific mortar adhesive shall be as recommended by the manufacturer for the intended application.

D. Epoxy Tile Adhesives:
   01 In accordance with ANSI A 118.3
   02 Provide where indicated on the Drawings, or required for setting as tile as specified by ANSI A 108.6 Chemical Resistant, Water-Cleanable Tile Setting and Grouting Epoxy.
   03 Epoxy mortar shall exhibit excellent non-sag and non-slump properties.
   04 Specific mortar adhesive shall be as recommended by the manufacturer for the intended application.

E. Standard Grout:
   01 Polymer modified, Portland cement based, sanded grout.
   02 In accordance with ANSI A118.7.
   03 Suitable for 1/16” to 1/8” joint widths.
   04 Color consistency throughout entire installation.
   05 Contents / additives to inhibit mold and mildew formulation and growth.
   06 Provide in pre-mixed bags / containers that require only the addition of water.
   07 Specific grout shall be as recommended by the manufacturer for the intended application.
   08 Grout color shall be as selected by the Architect from the manufacturer’s full range of color selections.

F. Epoxy Grout:
   01 High performance, cement based, epoxy grout.
   02 In accordance with ANSI A 118.3.
   03 Suitable for 1/8” to 3/8” joint widths.
   04 Color consistency throughout entire installation.
   05 Contents / additives to inhibit mold and mildew formulation and growth.
   06 Provide in pre-mixed bags / containers that require only the addition of water.
   07 Specific grout shall be as recommended by the manufacturer for the intended application.
   08 Grout color shall be as selected by the Architect from the manufacturer’s full range of color selections.

G. Joint Sealers:

01 High performance, single-compound, 100% silicone sealant formulated specifically for ceramic tile and stone applications.
02 In accordance with ASTM C920 - Standard Specification for Elastomeric Joint Sealants, Type S, Grade NS, Class 25.
03 Formulated with fungicides to resists mold and mildew growth.
04 Color consistency throughout entire installation.
05 Specific grout shall be as recommended by the manufacturer for the intended application.
06 Sealant color shall match grout color as selected by the Architect from the manufacturer's full range of color selections.

H. Crack Isolation Membrane
01 Design is based on Mapei Mapeguard 2 or Dal-Tile Dal-CIM 500EX or as recommended by the manufacturer.
02 Crack isolation membrane shall be included in the system warranty.

2.6 EXTRA TILE

A. Deliver an unopened box of each color of each type of tile to the Owner at Substantial Completion.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examination: Examine substrates for expansion joints and defects which may affect the work. Do not start work until defects have been corrected. Ensure that surfaces are:
01 Dry, clean, free of oily or waxy films, free of curing compounds.
02 Firm and level within specified tolerances.
03 Minimum of 40°F and rising.

B. Tile Contractor shall examine preparatory work by others and notify Architect of any imperfections which would affect a satisfactory completion of this tile work.

C. Verify that slab is free of cracks, waxy or oily films, and is well cured. Absence of such notification shall constitute acceptance of responsibility by tile contractor.

D. Where required for specified systems warranty, provide preparation materials in accordance with manufacturer's recommendations and installation instructions.

3.2 INSTALLATION

A. Unless shown otherwise on the Drawings, align joints vertically and horizontally.
01 Where multiple tile sizes are used on the same wall / plane, arrange tiles to align common joints.

B. Use epoxy adhesive and epoxy grout at all wet locations, including, but not necessarily limited to:
01 Restrooms
02 Shower areas
03 Food service areas.

C. Coordinate ceramic tile joints to align with wall expansion / control joints in CMU and framed walls.
01 Provide non-grouted, sealed joints in ceramic tile at wall expansion / control joints.

02 At wall expansion joints that are installed with an expansion joint cover, locate ceramic tile joints as required to accommodate the expansion joint cover.

D. Lay out tile on each wall / plane so that the minimum size tile used is not less than 1/2 tile size.

E. Where partial tile is required saw-cut to provide straight, flush, smooth edges.
01 Where wall patterns indicated on the Drawings require cut tile (i.e. rotated accent tile, and similar), ease the edges of saw-cut tile.

F. Provide preformed inside and outside corner tile units where applicable.

G. Bullnose Tile Locations:
01 Provide bullnose edged tile at the top course of tile that does not extend full height to ceilings.
02 Provide bullnose edged tile at the bottom course of tile that directly above seamless epoxy flooring bases.

H. Set interior wall tile in accordance with T.C.A. Spec. W-242-19 for gypsum board substrate. Set interior wall tile on CMU in accordance with T.C.A. Spec. W-211-18.

I. Set floor tile and grout in accordance with T.C.A. Spec. F112-08. (Allow a minimum of 24 hours after tiles is set before grouting.) Slope tile to floor drains.

J. Form internal angles square.

K. Install expansion joints in accordance with T.C.A. Publication EJ171-18.
01 Provide expansion joints at maximum 24’-0” O.C., and more often if recommended by the manufacturer for the specific installation.
02 Additionally, align ceramic tile joints to coordinate with wall expansion / control joints.

L. Joint Sealers:
01 Provide at all inside corners of intersecting tiled walls.
02 Provide at all tiled terminations adjacent to door frames and other built-in assemblies.
03 Sealed joints shall be non-grouted, and sealed continuous.

M. Clean all tile surfaces upon completion. Protect finish tile work as required from damage by other trades / activities.

END OF SECTION

SECTION 09 30 16

QUARRY TILING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: Provide all quarry tile flooring as indicated on the Drawings.
   01 Provide all quarry tile floor products / work as indicated on the Drawings and required for a complete installation.
   02 Provide all quarry tile base products / work as indicated on the Drawings and required for a complete installation.
   03 Provide other quarry tile setting and sealing products as required for a complete installation.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete.
   02 Section 09 30 13 – Ceramic Tiling.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.
   04 Composite Sample: Submit samples of selected tile and grout mounted on a minimum 12" x 12" board, or larger if necessary, indicating tile pattern / installation, joint size and grout color.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American National Standards Institute (ASNI):
   01 ANSI A108 Series: Specifications for Installation of Ceramic Tile and Dimensional Tile.
   02 ANSI A 108.1A – Specifications for Installation of Ceramic Tile in the Wet Set Method.
   03 ANSI A 108.10 – Load Bearing, Bonded, Waterproof Membranes for ThinSet Ceramic and Dimensional Tile.
   04 ANSI A118 Series – Specifications for Ceramic Tile Mortars and Grouts.
   05 ANSI A 136.1 – Organic Adhesives for Installation of Ceramic Tile.
   06 ANSI A 137.1 – Specifications for Ceramic Tile.

B. American Society for Testing and Materials (ASTM):
   01 ASTM C499 – Facial Dimensions and Thicknesses of Flat, Rectangular Tile by the Taber Abraser.
   02 ASTM C501 – Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
   03 ASTM C1028 - Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Tile Like Surfaces by the Horizontal Dynamometer Pull Meter Method.

C. Tile Council of North America (TCNA):
   01 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation (latest edition).

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
   01 Level Surfaces: Minimum of 0.6 (Wet).
   02 Step Treads: Minimum of 0.6 (Wet).
   03 Ramp Surfaces: Minimum of 0.8 (Wet).

1.5 WARRANTY

A. The tile installation, including tile products, mortar adhesives and grout, shall be complete system as recommended by the manufacturer for the specific installation.
B. Provide a complete systems warranty, issued by the tile setting manufacturer that will cover the entire tile installation system against defects for a minimum of five (5) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on specific products, finishes and colors as manufactured by DalTile as identified on the Drawings.
   01 Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings as approved by the Architect.
   02 Refer to Specification Section 00 AF – Subcontractor / Manufacturer Prequalification.

D. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
   01 American Olean
   02 Crossville
   03 Interceramic Tile and Stone Gallery
   04 Mannington

2.2 QUARRY TILE MATERIALS

A. Quarry tile shall be DalTile Quarry Tile
   01 Field Tile: 6" x 6".
   02 Coved Base: 5” x 6”.
   03 Colors as indicated on the Drawings.

2.3 QUARRY TILE SETTING MATERIALS

A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

B. Epoxy Adhesive: ANSI A118.3, thinset bond type.

C. Mortar Bed Materials:
   01 Portland cement: ASTM C150, type 1, gray or white.
   02 Hydrated Lime: ASTM C207, Type S.
   03 Sand: ASTM C144, fine.
   04 Latex additive: As approved.
   05 Water: Clean and potable.

D. Mortar Bond Coat Materials:
   01 Dry-Set Portland Cement type: ANSI A118.1.
   02 Latex-Portland Cement type: ANSI A118.4.
   03 Epoxy: ANSI A118.3, 100 percent solids.

E. Epoxy Grout: ANSI A118.3, 100 percent solids epoxy grout; color as selected.

F. Silicone Sealant:
   01 Silicone sealant, moisture and mildew resistant type, white; use for shower floors and shower walls.
   02 Sealant shall have a T Rating suitable for heavy traffic.

G. Cleavage Membrane (as recommended by the tile manufacturer for the specific installation).
   01 Asphalt Saturated Felt, 15 LB, conforming to ASTM D226, Type 1.
   02 Polyethylene Film, minimum 4 Mil thickness, conforming to ASTM D4397.

H. Mortar shall be acid resistant.

I. Epoxy grout shall conform to ANSI A118.3. Color as selected by Architect.

J. Design of quarry tile sealer is based on Mapei Ultracare Penetrating Plus Tile Stone and Grout Sealer or as recoomended by the manufacturer.
01 Quarry tile sealer shall be included in the system warranty.

K. Extra Tile: Deliver an unopened box of quarry tile to the Owner at Substantial Completion.

2.4 WARRANTY

A. The manufacturer shall warrant the quarry tile materials against defects in product quality and / or product failure for a period of two (2) years from Substantial Completion.

PART 1 - EXECUTION

3.1 EXAMINATION

A. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

B. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION – FLOORS – MORTAR BED METHOD

A. General:
01 Comply with ANSI A108.1, ANSI A108.2, and the "Handbook for Ceramic Tile Installation" of the Tile Council of America. TCNA Spec F114.
02 Maintain minimum temperature limits and installation practices recommended by materials manufacturers.

B. Over interior concrete substrates install in accordance with TCNA Handbook Method F111, with cleavage membrane, unless otherwise indicated.

C. Cleavage Membrane: install in accordance with TCNA Handbook Method F121.
01 Lap edges and ends.

D. Mortar Bed Thickness: 1-1/4 to 2-inch (32 to 51 mm) maximum, unless otherwise indicated.

E. Epoxy Grout: install in accordance with TCNA Handbook Method F132, bonded.

F. Limits of Tile:
   01 Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions.
   02 Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

G. Joining Pattern:
   01 Lay tile in grid pattern.
   02 Align joints when adjoining tiles on floor and base are the same size.
   03 Layout tile work and center the tile fields both directions in each space.
   04 Adjust to minimize tile cutting. Minimum tile size used is 1/2 size.

H. Install expansion and control joints in accordance with TCNA Publication EJ-171.
   01 Keep expansion joints free of adhesive or grout.
   02 Apply sealant to joints.

I. Accurately cut and fit tile to penetrations through tile, leaving sealant joint space.

J. Form corners and bases neatly. Align floor joints.

K. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size.
   01 Make joints watertight, without voids, cracks, excess mortar, or excess grout.

L. Install in strict accordance with tile manufacturers installation instructions and recommendations for the specific installation.

M. Install thresholds where indicated.

N. Sound tile after setting. Replace hollow sounding units.

O. Allow tile to set for a minimum of 48 hours prior to grouting.

P. Grout tile joints. Use epoxy grout unless otherwise indicated.

Q. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 CLEANING AND PROTECTION

A. Cleaning:
   01 Upon completion of placing and grouting, clean the work of this Section in accordance with recommendations of the manufacturers of the materials used.
   02 Protect surfaces from effects of acid cleaning.
   03 Flush surfaces with clean water before and after cleaning.

B. Provide tile surfaces clean and free from cracked, broken, chipped, unbound, and otherwise defective units.

C. Provide required protection of tile surfaces to prevent damage and wear prior to acceptance of the work by the Owner.

D. The Contractor shall replace any tiles damaged or stained during the construction process.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL TILE CEILINGS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
- 01 Ceiling suspension system.
- 02 Acoustical, vinyl covered gypsum board and / or wood ceiling tiles as indicated or scheduled on the Drawings.
- 03 Acoustical diffusers.
- 04 Fire protection over light fixtures and other ceiling mounted items as required to meet UL designs for fire rated ceiling assemblies.

C. Related Work:
- 01 Section 01 11 23 – Code Summary
- 02 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
- 01 Show profiles, sizes, spacing and locations of assembled components.
- 02 Show details of shop fabrications, connections and details.
- 03 Show details of field fabrications, connections and details.
- 04 Provide calculations demonstrating compliance with wind load and other requirements.
- 05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
- 01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
- 02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
- 01 Include recommended cleaning products and instructions for use.
- 02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
- 01 Provide two (2) samples of each finish for suspension grid and ceiling tile for selection by the Architect.

02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 4” x 4” for acoustical tile, and minimum 8” length of suspension grid; but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. ASTM International (ASTM):
01 ASTM A641/A641M-09a - Zinc-coated (Galvanized) Carbon Steel Wire.
02 ASTM A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
03 ASTM C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
04 ASTM C634-13 - Terminology Relating to Environmental Acoustics.
05 ASTM C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
06 ASTM C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
07 ASTM C1396 – Standard Specification for Gypsum Board.
08 ASTM D1779-98 - Adhesive for Acoustical Materials.
09 ASTM E84-15b - Surface Burning Characteristics of Building Materials.
10 ASTM E119-16 - Fire Tests of Building Construction and Materials.
11 ASTM E413-16 - Classification for Rating Sound Insulation.
12 ASTM E580/E580M-14 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
13 ASTM E1264-14 - Classification for Acoustical Ceiling Products.

B. Underwriters Laboratory (UL):
01 Underwriters Laboratory (UL) assemblies as required for the Work.
02 Refer to the Drawings and other Specification sections for locations, UL Designs and requirements for fire rated assemblies.

1.4 QUALITY ASSURANCE

A. Projection Conditions:
01 Do not install acoustical ceiling until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead mechanical work is completed, tested and approved.
02 Maintain temperature at minimum 60°F and humidity if 40% to 50% prior to, during, and after installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Design of Acoustical Tile Ceilings is based on the following products / manufacturers:
01 Suspension System: Armstrong World Industries.
03 Acoustical Tiles: Rockfon North America: Stone wool.
04 Wood Ceiling Tiles: Armstrong World Industries.
05 Ceiling Cloud Trim: Armstrong World Industries.
06 Gypsum Board Ceiling Tiles: National Gypsum Company.
07 Suspension Clips: Nitroset Solid Propellant Fastening System.

08 Lay-In Sound Diffusers and Reflectors: Kinetics Noise Control.
09 Flexible Wall Angles: Trim-Tex.

B. The following manufacturers are acceptable for use for this Section, provided all specified requirements are met or exceeded.
01 Rockfon North America
02 Acoustical Solutions - Lay-In Sound Diffusers and Reflectors
03 CertainTeed
04 Chicago Metallic
05 Conwed
06 Donn Products, Inc.
07 USG.

2.2 SUSPENSION SYSTEMS

A. Suspension System – Non-Fire-Rated Assemblies – Ceiling Type **"A"**:
01 Design is based on Armstrong "Prelude ML" Exposed Tee suspension system.
02 Cross Section: 1-1/2" x 15/16".
03 Standard hot-dipped galvanized steel (ASTM C635).
04 Finish: Factory Pre-Painted - baked polyester.
05 Typical Color: Low sheen satin - White.
06 Non-Typical Color: Low sheen satin – Black. To be used at dark rooms, black-box theaters and other locations as indicated on the Drawings.
07 Provide 9/16" x 15/16" angle molding at interface of all vertical walls. Material to match primary suspension system material(s).

B. Suspension System – Semi-Wet Areas – Ceiling Type **"B"**:
01 Same as suspension systems described above for Type "A" ceiling systems; with aluminum cap.
02 Provide at restrooms, mechanical rooms, and similar locations.
03 Verify locations required to be part of a fire-rated assembly.

2.3 LAY-IN TILES

A. Acoustical Lay-In Tiles – Non-Fire-Rated Assemblies – Ceiling Type **"A"**:
01 Design is based on Rockfon "Stone Wool" acoustical ceiling tile.
02 Rockfon no. 41100, square edge.
03 Size: 24" x 24" x 5/8".
04 Typical Color: White.
05 Non-Typical Color: Low sheen satin – Black. To be used at dark rooms, black-box theaters; and other locations as indicated on the Drawings.
06 Fire Resistive.
07 HumiGuard Plus sag resistant.
08 BioBlock+ anti-microbial.
09 Minimum NRC: 0.55.
10 Minimum CAC: 35 dB.
11 Minimum Light Reflectance: 85%.

B. Acoustical Lay-In Tiles – Rated Assemblies – Ceiling Type **"A"**:
01 Design is based on Armstrong "Fine Fissured" acoustical ceiling tile.
02 Armstrong no. 1831, square edge.
03 Size: 24" x 24" x 5/8".
04 Typical Color: White.
05 Non-Typical Color: Low sheen satin – Black. To be used at dark rooms, black-box theaters; and other locations as indicated on the Drawings.
06 Fire Rating: UL Class A, suitable for use in rated assemblies.

07 HumiGuard Plus sag resistant.
08 BioBlock+ anti-microbial.
09 Minimum NRC: 0.55.
10 Minimum CAC: 35 dB.
11 Minimum Light Reflectance: 85%.

C. Interior Gypsum Board Lay-In Tiles – Non-Fire-Rated and Fire-Rated Assemblies – Ceiling Type **"B"**:
01 Design is based on National Gypsum "Gold Bond Gridstone Fire Shield Gypsum Ceiling Panels".
02 Core: Fire and sag resistant gypsum board.
03 Size: 24" x 24" x 1/2".
04 Surface Finish: Minimum 2 mil. Stipple textured vinyl laminate. Color: white.
05 Fire Rating: UL Class A, suitable for use in rated assemblies.
06 HumiGuard Plus sag resistant.
07 BioBlock+ anti-microbial.
08 Minimum NRC: 0.55.
09 Minimum CAC: 46 dB.
10 Minimum Light Reflectance: 75%.

D. Gypsum Board Lay-In Tiles – Non-Fire-Rated and Fire-Rated Assemblies – Ceiling Type **"C"**:
01 Design is based on National Gypsum "Gold Bond Gridstone Hi-Strength Gypsum Ceiling Panels".
02 Core: High strength, sag resistant gypsum board.
03 Size: 24" x 24" x 5/16".
04 Surface Finish: Minimum 2 mil. Stipple textured vinyl laminate. Color: white.
05 Fire Rating: UL Class A, suitable for use in rated assemblies.
06 HumiGuard Plus sag resistant.
07 BioBlock+ anti-microbial.
08 Minimum NRC: 0.55.
09 Minimum CAC: 41 dB.
10 Minimum Light Reflectance: 75%.

2.4 OTHER PRODUCTS

A. Suspension Wire:
01 12-gauge solid, galvanized steel wire in lengths as required to overhead structural elements for the installation of each specific room / area.
02 Maximum Spacing: at 4'-0" O.C. both directions, wrapped tightly at least 3 full turns.
03 Provide a separate hanger wire at each corner of all lay-in light fixtures.
04 Verify and adhere to additional hanger and spacing conditions as required by provisions of Division 26 – Electrical, and UL Designs for rated assemblies.

B. Suspension Clips:
01 Design is based on Nitroset Solid Propellant Fastening System; CLU222.
02 Configuration: Utility Clip Assembly.
03 Minimum Size: 7/8" shank length; 1/8" shank diameter.
04 Allowable Loads (based on 4000 PSI concrete) at 3/4" embedment depth:
a. Tension: 120 lb.ft.
b. Shear: 165 lb.ft.
c. 45-Degree: 120 lb.ft.
05 Provide where structural conditions do not facilitate suspension wire fastening directly to steel structure.
06 Fastening to Metal Decks: Allowable only at deck valleys where a minimum of 2-1/2" depth of concrete is present.

C. Retention Clips:
   01 Design of retention clips is based on Armstrong World Industries No. 414 Retention Clip; or equal accepted by the Architect.
   02 Provide at locations indicated on the Drawings and / or required by specified UL design.

D. Ceiling Cloud Perimeter Trim:
   01 Design is based on Armstrong Axiom Vector Trim.
   02 Height: 4".
   03 Provide in straight or curved sections as required for ceiling clouds indicated on the Drawings.

E. Shadow Molding:
   01 Design is based on USG / Donn MS-174 Shadow Molding.
   02 "W" shaped molding producing a 3/8" x 3/8" reveal.
   03 Provide at all conditions where lay-in ceilings interface with gyp board ceilings in the same plane.

F. Curved Ceiling Edge Molding:
   01 Design is based on Trim-Tex "Flex-Grid Angle"; No. 8159.
   02 "L" shaped molding, nominal 1-1/8" x 9/16.
   03 Combination rigid and flexible PVC to adapt to radii as small as 6".
   04 Provide at all conditions where lay-in ceilings interface with a curved vertical surface (columns, walls, etc.).

G. Fixture Covers: Where ceilings are part of a fire-rated assembly and required by the UL design, provide UL conforming acoustical tile covers at light fixtures, and other fixtures / equipment installed through the ceiling plane.

2.5 EXTRA STOCK

A. Deliver two (2) unopened cartons of each type of ceiling board at Substantial Completion to location as directed by Owner.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that walls are flat and wall corners square. Commencing work shall be construed as acceptance of preceding work performed by others, as suitable to receive work specified in this Section.
   01 Ceiling wall angles shall be flush with substrate.
   02 Maximum deviation from flush shall be 1/16".

B. Where suspended ceilings interface flush with other work (window / door heads, fur-downs, etc.) verify interfacing work is at correct elevation and suitable for a flush interface.
   01 Do not manipulate ceiling system to adapt to con-conforming work.

C. Ensure that wall control joints are flat and will not cause wall mold to misalign at those locations.

D. Do not install any ceiling tile until all above ceiling inspections and corrections have been completed.

E. Preliminary Layout:
   01 Ceiling grid layouts shown on the Drawings are generalized layouts and may not accurately depict as-built conditions.
   02 Ceiling grids shall be centered within each room / area such that tile cuts at perimeter walls shall be not less than a half-tile or 12", whichever is less.

03 Prior to commencing work coordinate with Architect in field to resolve layout in rooms / areas that do not adhere to the above requirement.
04 Do not proceed within a room / area until discrepancy(s) have been fully resolved.

3.2 SUSPENDED CEILING SYSTEMS

A. General:
01 All suspension systems shall be attached to building structure; or other suitable framing specifically approved by the Architect.
02 Attaching suspensions systems to the following shall not be permitted:
a. Ductwork or HVAC equipment
b. Electrical conduit or fixtures.
c. Plumbing piping.
03 Verify ceilings can be installed at heights indicated or scheduled on the Drawings. Coordinate with Architect to resolve conflicts that preclude mounting at the heights indicated.
04 Ceilings shall be installed level, within a tolerance of 1/8" per 10'-0", non-cumulative; unless clearly shown to be sloped on the Drawings.

B. Suspension Wires:
01 The intent of this specification is for the suspension wires to be wrapped around primary or secondary structural steel components where ever practical. Suspension from bridging is not permitted.
02 Suspension wires shall be wrapped over structural steel components and twisted a minimum of 3 times (1080 degrees).
03 Maximum suspension wire may be angled up to a maximum of 45 degrees.

C. Suspension Clips:
01 Suspension clips shall be permitted only where structural steel components do not permit installation per the paragraph above.
02 Architect must approve all locations where suspension clips are proposed to be fastened to metal floor or roof deck.
03 All connections to metal decks shall be made at the valley configuration of the metal deck surfaces.
04 Connection to horizontal valley surfaces of the metal deck shall be minimized; and connections shall be at the angled walls of the deck valleys.
05 Install suspension clips in strict accordance with manufacturer's standards and recommendations, using manufacturer's equipment specifically designed for the purpose.

D. Attachment of grid members to wall molding with pop rivets is not permitted.
01 Hanger wire at 45 degrees, approximately 10 inches long may be used to tie the grid to the wall above the ceiling to prevent eventual disengagement of the two components.

E. Install ceiling systems by skilled workmen in accordance with manufacturer's printed instructions, the reviewed Shop Drawings and reflected ceiling plans.
01 Exposed surfaces of acoustical units shall be level and flush, with all joints straight and true.
02 Cutting and fitting around all items protruding through acoustical ceiling shall be done neatly.
03 Wall angles and edge moldings shall have flush hairline joints, with all corners mitered.
04 Where indicated or required, install retention clips at sides of acoustical panels in accordance with manufacturer's standards and instructions.

F. Align beams or tees with angle molding at corners, unless authorized by Architect.

G. Fixture Covers:
   01 At required locations, install fixture covers at all light fixtures and other required fixtures / equipment installed in the ceiling grid.
   02 Installation shall conform to the specified UL design with respect to configuration, assembly and installation.

END OF SECTION

SECTION 09 61 43

CONCRETE FLOOR SEALER

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide concrete sealer at all interior rooms / areas scheduled to remain concrete.
   02 Central plant.
   03 All mechanical rooms.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

D. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

1.3 REFERENCES

A. ASTM International:
   01 ASTM C156 – Standard Test Method for Water Loss [from a Mortar Specimen] Through Liquid Membrane-Forming Curing Compounds for Concrete.
   02 ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   03 ASTM C1315 – 11 Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

PART 2 - PRODUCT

2.1 MANUFACTURERS

A. Design is based on products manufactured by Hillyard Chemical Company.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 W.R. Meadows
   02 Prosoco
   03 Euclid Chemical
   04 L.M. Scofield

2.2 MATERIALS

A. Design of concrete floor sealer is based on Hillyard Concrete Defense Repel Penetrating Seal.

B. Concrete floor sealer shall be a water based, clear semi-gloss sealer specifically formulated for application on interior concrete.

C. Performance Test Data:
   01 Federal EPA VOC.
   02 ASTM C1315, Type 1, Class A.
   03 ASTM C156.
   04 ASTM C309, Type 1, Clear.

D. Technical Data:

01	Specific Gravity:	0.77
02	Total Solids:	32%
03	Wt./Gal.:	7.9 Lbs.
04	Flash Point:	>100°F (>38°C)
05	Freeze Point:	-8°F (-22°C)
06	VOC Content:	Complies with USEPA AIM VOC regulations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Concrete slabs shall be smooth, dry, and free of any foreign materials.

B. Apply two coats of specified finish in strict accordance with manufacturer's instructions.

C. Allow approximately 24 hours drying time between installations of coats. Do not apply second coat until Architect has observed the first coat application.

D. Install coating after all painting operations are completed.

E. Apply any painted stripes or graphics indicated on Drawings. Allow approximately 24 hours drying time between installation and additional coats.

F. Apply two (2) additional coats of concrete floor sealer over any areas receiving striping or graphics as specified above. Total for striped areas is 4 coats.

END OF SECTION

SECTION 09 62 23

RESILIENT SPORTS FLOORING

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CC AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. Refer to CSP Proposal Instructions.

B. Scope of Work:
   01 Foam-backed sheet vinyl flooring designed for free-floating installation with painted lines.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 09 65 19 – Resilient Tile Flooring
   03 Section 09 91 00 – Painting and Repainting

1.2 SUBMITTALS

A. Provide all submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Product Data. Manufacturer's Specification and data for all products proposed to be furnished as necessary to demonstrate compliance with the specified requirements.

C. Manufacturer's installation instructions for each product.

D. Maintenance Data. Include in the final close-out documents the maintenance data describing the procedure to be followed in maintaining the materials.

E. Shop Drawings: Showing installation details and locations of borders, patterns, game lines, locations of floor inserts and seams.

F. Submittal Samples:
   01 Three manufacturer's color charts for selection of available colors.
   02 Three color chart sample of each available game line color.
   03 Three samples not less than 6 inches by 8 inches for each type of flooring indicated.

G. Samples for Verification:
   01 Three samples of wood visual wear layer not less than 24 inches by 36 inches to show that the visual appearance of required wood plank pattern complies with these Specifications. Include actual selected game-line and marker paint colors applied to flooring.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   01 ASTM D543 Standard Practices for Evaluating Resistance to Chemical Reagents.
   02 ASTM E648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using A Radiant Heat Energy Source.

03 ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
04 ASTM F970: Standard Test Method for Static Load Limit.
05 ASTM F1303: Standard Specification for Sheet Vinyl Floor Covering with Backing.
06 ASTM E1155: Standard Test Method for Determining FF (Floor Flatness) and FL (Floor Levelness) Numbers.
07 ASTM F1516: Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method.
08 ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
09 ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
10 ASTM F2772: Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems.
11 ASTM D5116: Standard for Determination of Organic Emissions From Indoor Materials/Products.

B. American Concrete Institute (ACI):
01 ACI 302.2R: ACI Guide for Concrete Slabs That Receive Moisture-Sensitive Flooring Materials.

C. EN (European Committee for Standardization):
01 EN 423 Resilient floor coverings - Resistance to staining.
02 EN ISO 717 Rating of sound insulation in buildings.
03 EN 1516 Surfaces for sports areas - Resistance to indentation.
04 EN 1517 Surfaces for sports areas - Resistance to impact.
05 EN 1569 Surfaces for sports areas - Behavior under a rolling load.
06 EN ISO 2813 Determination of specular gloss.
07 EN ISO 5470 Determination of abrasion resistance - Taber abrader.
08 EN 12235 Surfaces for sports areas - Vertical ball bounce.
09 EN 13036 Method for measurement of slip/skid resistance of a surface.
10 EN 14808 Surfaces for sports areas - Shock absorption.
11 EN 14809 Surfaces for sports areas - Vertical deformation.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
01 ISO 9001 Certified and ISO 14001 Certified.
02 At least ten (10) years of active experience in the manufacture and marketing of indoor resilient athletic flooring.
03 A provider of authorized installer training.

B. Installer Qualifications:
01 At least five (5) years of experience in the installation of resilient athletic flooring.
02 Experience on at least five (5) projects of similar size, type and complexity as this Project.
03 Employer of workers for this Project who are competent in techniques required by manufacturer for resilient athletic flooring installation indicated.

C. Fire Test Characteristics: As determined by testing identical products according to ASTM E648, Class 1, by a qualified testing agency acceptable to authorities having jurisdiction.

D. Athletic Performance Properties: Comply with ASTM F2772 Performance Level C2 for force reduction and ball rebound.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store flooring and installation materials in protected dry spaces, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55°F (13°C) nor more than 85°F (29°C).

B. Store the indoor resilient athletic surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to Project.

C. Store floorings on flat surfaces. Move floorings and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 FIELD CONDITIONS

A. Product Installation:
   01 Maintain temperatures during installation within range recommended by manufacturer, but not less than 65°F (18°C) in spaces to receive flooring one week before installation, during installation, and one week after installation.
   02 After installation, maintain temperatures within range recommended by manufacturer, but not less than 55°F (13°C) or more than 85°F (29°C).
   03 Prohibit traffic during flooring installation and for at least 48 hours after flooring installation.

B. Install flooring only after other finishing work, including painting and overhead work, has been completed.

1.7 WARRANTY

A. Special Limited Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace sports flooring that fails within specified warranty period.
   01 Failures include, but are not limited to, the following: Material manufacturing defects, Surface wear and deterioration to the point of wear-through.
   02 Warranty Period:
      a. For materials defects and surface wear-through: Fifteen (15) years from date of Substantial Completion.
      b. For surface wear: Fifteen (15) years from date of Substantial Completion.

B. Special Limited Warranty: Installer's standard form in which installer agrees to repair or replace sports flooring that fails due to poor workmanship or faulty installation within the specified warranty period.
   01 Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MATERIAL

A. Basis-of-Design Manufacture: Subject to compliance with requirements, provide Gerflor REC-60 sport flooring with full spread standard adhesive system.

B. Dual-durometer foam-backed sheet vinyl flooring designed for fully adhered athletic flooring applications.
   01 Overall Thickness: Not less than 0.24 inch (6.0 mm).
   02 Wear-Layer Thickness: Not less than 0.06 inch (1.5 mm).
   03 Backing: Very high density, closed cell foam.

04 Fiberglass Grid Layer: Double layer of non-woven fiberglass grid for dimensional stability. Systems with single layer of fiberglass grid not accepted.
05 Seaming Method: Heat welded.
06 Traffic-Surface Texture: Wood visual shall have wood grain embossed texture for a genuine wood appearance and Solid colors to have “pebbled” embossed texture for an attractive appearance.
07 Bacteriostatic and Fungicidal Treatment: Manufacturer’s factory-applied permanent treatment throughout the flooring material which can improve indoor air quality and reduce asthma and allergy risks associated with bacterial and mold growth.
a. Basis-of-Design Product: Gerflor Sanosol.
08 Applied Finish: Manufacturer's, factory-applied, permanent and UV-cured.
a. No-Wax finish: Published product literature identifying factory applied finish as, “No-Wax-Just clean and rinse”.
b. Basis-of-Design Product: Gerflor Protecsol.
09 Field-Applied Finishes: None required and not allowed.
10 Roll Size:
a. Roll Width: Rolls to be a minimum width of 59 inches (1.5m) wide.
b. Roll Length Wood visual: Rolls to be a minimum length of 86 feet, 6 inches (26.4m).
c. Roll Length Solid color: Rolls to be a minimum length of 67 feet, 3 inches (20.5m)
d. Roll length of wood visual flooring shall be sufficient to cover the full length of a high school main basketball court (84’-0”) without splicing or end-of-roll (butt) seams within main court boundary**.**
11 Color and Pattern: As selected by Owner.
12 Field-Applied Finishes: None required and not allowed.

C. Performance Criteria:
01 Shock Absorption/Force Reduction: ASTM F2772; Class C3 (34% to 46% Pass.
02 Ball Bounce: ASTM F2772; Pass, Greater than or equal to 90 percent.
03 Sliding/Coefficient of Friction: EN 13036; Pass.
04 Vertical Deformation: Maximum 3.5 mm; Pass.
05 Static Load Limit/Residual Indentation:
a. ASTM F1303; Pass, Static Load Resistance requirement of less than 0.005 inch of residual indentation as tested per ASTM F970 at prescribed test load of 175 p.s.i.
b. EN 1516; Pass, Less than or equal to 0.5 mm.
06 Resistance to Rolling Load: EN 1569; Pass.
07 Chemical Resistance: ASTM D543; OK. EN 423; OK.
08 Impact Resistance: EN 1517; Pass.
09 Abrasion Resistance: EN ISO 5470; Pass.
10 Sound Insulation: EN ISO 717; 18 dB.
11 Gloss/Brightness: EN ISO 2813; Pass.
12 Organic Emission: ASTM D5116; Pass
13 Fire Performance: ASTM E648; Greater than 0.45 W/cm2, Class 1.

D. Surface Maintenance Requirements: No-wax surface requiring only cleaning and rinsing.

E. Slab Moisture Design Tolerance: Maximum relative humidity (RH) of 95% when tested according to ASTM F 2170.

2.2 ACCESSORIES

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by athletic flooring manufacturer.

B. Adhesives: Water-resistant acrylic or pressure sensitive for seams and perimeter recommended by athletic flooring manufacturer for substrate and conditions indicated.
   01 Basis-of-Design Product: Gerflor Gerfix Spray Adhesive.
   02 Coverage: Full spread application for 100% coverage.

C. Heat Welding Rod: As supplied by indoor resilient athletic flooring manufacturer. Color shall blend with resilient athletic flooring color.

D. Game-Line and Marker Paint: Complete system including primer, compatible with flooring and recommended by flooring and paint manufacturers.

2.3 MANUFACTURERS

A. Basis-of-Design Manufacturer:
   01 Gerflor REC-60– (basis of design).

B. Approved Manufacturers: Approval by Architect of the following manufacturers does not relieve Contractor of responsibility to provide products which comply with all requirements of this Section.
   01 Taraflex Ominisport 6.2
   02 Conner Sports Flooring
   03 Dynamic Sports Construction, Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas where installation of floorings will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring installation and comply with flooring manufacturer's requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
   01 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials.
   02 Finishes of subfloors comply with tolerances and other requirements specified in Division 3.
   03 Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Tests to verify that the moisture evaporative rate or substrate relative humidity is within the manufacturer’s specified ranges.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.

B. Use trowelable leveling and patching compounds per flooring manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Place flooring and installation materials into spaces where they will be installed at least 48 hours before installation. Install flooring materials only after they have reached the same temperature as space where they are to be installed.

D. Sweep and then vacuum substrates immediately before installation. After cleaning, examine substrate for moisture, alkaline salts, grit, dust or other contamination. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General:
   01 Comply with flooring manufacturer's installation instructions.
   02 Take necessary precautions to minimize noise, odors, dust and inconvenience during installation.
   03 Fit flooring neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
   04 Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.

B. Lay out flooring as follows:
   01 Minimize number of seams and locate them at inconspicuous areas.
   02 Locate seams as shown on approved Shop Drawings.

C. Adhesive Installation: Adhere flooring products to substrates by applying adhesive at seams and entire perimeter using an approved acrylic or pressure sensitive adhesive complying with adhesive and flooring manufacturer instructions.

D. Vinyl Sheet Flooring Seams: Finish seams to produce surfaces flush with adjoining flooring surfaces. Comply with ASTM F1516. Rout joints and use heat welding rod to permanently and seamlessly fuse sections together.

3.4 GAME LINES AND LOGOS

A. Lay out game lines and logos to comply with rules and diagrams published by for the sports activities indicated.

B. Mask flooring at game lines and logos, and apply paint of color indicated to produce clean, sharp and distinct edges.

3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing flooring installation:
   01 Remove surface blemishes using cleaner recommended by flooring manufacturers.
   02 Sweep or vacuum floor thoroughly.
   03 Damp-mop flooring to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.

C. Clean floorings not more than four (4) days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean floorings using method recommended by manufacturer.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide resilient Luxury Vinyl Tile flooring as indicated or scheduled on the Drawings.
   02 Provide resilient Linoleum Tile flooring as indicated or scheduled on the Drawings.
   03 Resilient Cove Base.
   04 Rubber Stair Tread.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 All other Division 9 flooring specifications.

1.2 SUBMITTALS

D. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

E. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

F. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

G. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

H. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.

02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 8” x 8” but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. ASTM International:
01 ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces.
02 ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
03 ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
04 ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
05 ASTM F 925-13 - Standard Test Method for Resistance to Chemicals of Resilient Flooring.
06 ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading.
07 ASTM F1515 - Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
08 ASTM F 1700 - Standard Specification for Solid Vinyl Tile.
09 ASTM F 1861 - Standard Specification for Resilient Wall Base.
10 ASTM F 1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
11 ASTM F1914 - Standard Test Methods for Short-Term Indentation and Residual Indentation of Resilient Floor Covering.
12 ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

B. National Fire Protection Association (NFPA):
01 NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
02 NFPA 258 - Standard Test Method for Measuring the Smoke Generated by Solid Materials.

1.4 QUALITY ASSURANCE

A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold.
01 Protect adhesives from freezing.
02 Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF and a maximum temperature of 85ºF for at least 48 hours before, during, and for not less than 48 hours after installation.

B. Thereafter, maintain a minimum temperature of 55ºF in areas where work is completed.

C. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

D. Slab Moisture Content:
   01 Provide RH testing of floor slab in accordance with manufacturer's standards and directions.
   02 Flooring specifications are based on RH levels at 95% or less.
   03 Where slab RH exceeds 95%, provide manufacturer's enhanced adhesives designed for RH levels in slab.

1.6 WARRANTY

A. Resilient Flooring System: Submit a written warranty executed by the manufacturer, agreeing to repair or replace system (subfloor preparation products, adhesive, and floor covering) that fails within the warranty period.

B. Warranty Period: Twenty (20) years.

PART 2 - PRODUCTS

2.1 RESILIENT LUXURY VINYL TILE MANUFACTURERS

A. Design of luxury vinyl tile (LVT) resilient flooring based on products manufactured by Mohawk Industries Inc.
   01 LVT flooring is based on specific products, finishes and colors as identified on the Drawings.
   02 Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings. Refer to section 01 25 00.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this section, provide all proposed products meet or exceed the specified requirements. Additionally, the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules. Submit proposed product for review and acceptance by Architect during bidding / proposal phase.
   01 Armstrong
   02 Aspecta
   03 Forbo
   04 Karndean
   05 Mannington
   06 Tarkett Flooring

2.2 LUXURY VINYL TILE

A. Luxury Vinyl Flooring products are based on Mohawk Industries Chromoscope series LVT.

B. LVT Rectangle Tile:
   01 12" x 24" x 3.2 mm with 28 mil wear layer.
   02 Refer to drawings for location and pattern details.
   03 Used at all locations unless noted 'plank' on the finish schedules.
   04 Color as selected by the Architect from manufacturer's full range of selections.

C. LVT Patterns:
   01 Provide LVT tile patterns as indicated on the Drawings.
   02 All patterns shall be composed of full tile sizes, except edge conditions, unless indicated otherwise on the Drawings.
   03 Architect shall furnish Detailed Drawings indicating specific locations of each patterns.

D. LVT Adhesive:
   01 Provide manufacturer's recommended adhesive for the specific installation of the project.
   02 Adhesive shall be rated for use for slab RH levels of at least 95%.

E. Physical Properties:
   01 Classification: ASTM F1700 Class III Type B.
   02 Total Thickness: 0.120".
   03 Wear Layer Thickness: 30 mil minimum.
   04 Edge Treatment: Square.

F. Physical Performance:

01	Flexibility:	ASTM F137	Pass
02	Static Load:	ASTM F970	Pass
03	Residual Indentation:	ASTM F1914	Excellent
04	Flammability:	ASTM E648	NFPA Class 1
05	Slip Resistance:	ASTM D2047	Pass / ADA Compliant
06	Smoke Density:	ASTM E662	<450
07	Chemical Resistance:	ASTM F925	Excellent
08	Resistance to Light:	ASTM F1515	Excellent

2.1 RESILIENT LINOLEUM TILE MANUFACTURERS

A. Design of Linoleum Tile flooring is based on products as manufactured by Forbo Flooring Systems.
   01 LVT flooring is based on specific products, finishes and colors as identified on the Drawings.
   02 Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings. Refer to section 01 25 00.

B. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
   01 Mohawk (basis of design)
   02 Aspecta
   03 Forbo
   04 Armstrong
   05 Mannington

2.2 LINOLEUM TILE FLOORING

A. Linoleum tile flooring products are based on Forbo Flooring Systems series MCT Marmoleum flooring.

B. Linoleum Tile Flooring
   01 Classification: ASTM F1700 Class III Type B.
   02 Through coloring.
   03 Size: 13” x 13” x 1/10 inch gauge
   04 Backing: Polyester
   05 Edge Treatment: Square.
   06 Patterns and Colors: Refer to drawings for selections, patterns and locations of various tiles.
   07 Warranty: 30 year material defect. Provide all necessary provisions to meet this warranty (ie manufacturer representation, reports, adhesive, etc)

C. Physical Performance:

01	Flexibility:	ASTM F137	Pass
02	Static Load:	ASTM F970	Pass
03	Residual Indentation:	ASTM F1914	Excellent
04	Flammability:	ASTM E648	NFPA Class 1
05	Slip Resistance:	ASTM D2047	Pass / ADA Compliant
06	Smoke Density:	ASTM E662	<450
07	Chemical Resistance:	ASTM F925	Excellent
08	Resistance to Light:	ASTM F1515	Excellent

2.3 RESILIENT RUBBER MANUFACTURERS

A. Design of resilient materials is based on specific products, finishes and colors as manufactured by Roppe as identified on the Drawings.

B. Design of metal transitions is based on specific products, finishes and colors as manufactured by Schluter Systems as identified on the Drawings.

C. Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings as approved by the Architect. Refer to specification Section Subcontractor / Manufacturer Prequalification

D. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
   01 R.C. Munson
   02 Flexco
   03 Nora Rubber Co.
   04 Burke-Mercer
   05 Johnsonite

2.4 RESILIENT MATERIALS

A. Base:
   01 Quality Standard. ASTM-1861-98, Type TS 100% rubber base with matching end stops and molded corner units.
   02 Type. Top-set cove; 48 inch lengths or in roll
   03 Height. 4 inches, unless shown otherwise

04 Thickness. Full 0.125
05 Color. As selected by Architect from manufacturer's standard colors.

B. Resilient Reducer Strips:
01 1” wide x 1/8” thick, rubber, tapered or bullnose edge, color as selected by Architect from manufacturer's standard colors.

C. Stair Tread:
01 Design is based on Roppe model 97 stair tread with raised circular pattern.
02 One-piece nosing, tread-riser rubber stair tread.
03 The top surface shall have round pastrilles.
04 The bottom surface shall be flat back, sanded for maximum adhesion.
05 Matching material at landings.
06 Color. As selected by Architect form manufacturer’s standard colors.

D. Primers and Adhesives
01 Concrete Slab Primer: Non-staining type as recommended by material manufacturers.
02 Adhesives: Waterproof, stabilized type as manufactured by resilient material manufacturer.

2.5 METAL TRANSITION MATERIALS

A. Design is based on products manufactured by Schluter Systems.

B. Flooring Transitions: Provide the following flooring transitions where applicable:
01 Porcelain Tile to RES: Model Reno TK
02 Porcelain Tile to carpet: Model Reno TK
03 Carpet to RES: Model Reno TK

C. Stair Nosing: Provide the following stair nosing where indicated on the Drawings
01 Monumental / Open Stairways: Model TREP-E
02 Stainless steel with slip resistant wear surface
03 Size: 1-3/16” horizontal surface by 3/8” front edge.
04 Verify exact height required for specific finish floor material installed on stair treads.

PART 3 - EXECUTION

3.1 INSPECTION

D. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

E. Subfloors:
01 Verify that substrate is smooth, level, at required finish elevation, and without more than 1/8 inch in 10'-0" variation from level or slopes shown on the drawings.
02 Prior to laying materials, broom clean or vacuum the surfaces to be covered, and inspect the subfloors.

3.2 INSTALLATION

A. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

B. Installing Resilient Tiles:
   01. Place units with adhesive cement in strict compliance with the manufacturer's recommendations.
   02. Butt units tightly to vertical surfaces, nosings, edgings, and thresholds.
   03. Scribe, as necessary, around obstructions and to produce neat joints.
   04. Place tiles tightly laid, even, and in straight parallel lines.
   05. Extend units into toe spaces, door reveals, and in closets and similar spaces.
   06. Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite edges of the room are of equal width.
      a. Adjust as necessary to avoid use of cut widths less than 3 inches wide at edge of space.
      b. Lay units square to axis of the room or space.
   07. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.
   08. Lay in alternating pattern with grain in all units running 90 degrees from adjacent unit.
   09. Place resilient edge strips tightly butted to units and secured with adhesive, providing at all unprotected edges, unless otherwise shown.

F. Installing Base:
   01. Install base on solid backing. Adhere tightly to wall and floor surfaces.
   02. Use factory-preformed exterior corners, and factory preformed or job-mitered interior corners.
   03. Scribe and fit to doorframes and other obstructions.
   04. Install base on all casework as shown, unless otherwise noted.
   05. Provide “Liquid Nails” adhesive at all transitions.

3.3 CLEANING AND PROTECTING

A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials.

3.4 EXTRA STOCK

A. Deliver to the Owner for his future use an extra stock of two unopened boxes of each color and pattern of tile selected, and one container of base adhesive.

END OF SECTION

SECTION 09 67 16.13

SEAMLESS EPOXY FLOORING

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CC AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to the CM@R Proposal Instructions.

B. Scope: Furnish and install the decorative epoxy flooring and integral base system as specified and indicated.
   01 The term “seamless epoxy flooring system” as used in this section will include the primers, resin systems and aggregate materials, topcoats, cove base materials, and any related materials for the project.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 09 30 13 – Ceramic Tiling

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer’s literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.

D. Installation Instructions: Submit manufacturer’s complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer’s complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Minimum size shall be 3" x 3", but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. Society for Protective Coatings (SSPC) Specifications and Standards:
   01 SPC-PA-3: "A Guide to Safety in Paint Application".
   02 SSPC-SP-13: "Surface Preparation of Concrete".

B. NACE (National Association of Corrosion Engineers):
   01 NACE Publication 6D-173, "A Manual for Painter Safety".
   02 NACE Publication 6G-164, "Surface Preparation Abrasives for Industrial Maintenance Painting".

C. ASTM (American Society for Testing and Materials):
   01 ASTM D4541 - L.R. "Standard Method for Pull-Off Strength of Coatings using Portable Adhesion Testers".
   02 ASTM E337 - L.R. "Standard Practice Test Method for Measuring Humidity with a Psychrometer".
   03 ASTM D4263-83 (1999), "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method".
   04 ASTM F1869-98, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride".
   05 ASTM D4414-95, "Standard Practice for Measurement of Wet Film Thickness by Notched Gages".
   06 ICRI Guide No. 03732, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays," International Concrete Repair Institute, Sterling, VA.
   07 ASTM 4262, "Standard Test Method for Measuring Surface pH of Acid Etched Concrete".
   08 ASTM D4259, "Standard Practice for Abrading Concrete".

1.4 QUALITY ASSURANCE

A. The Contractor shall meet the following requirements:
   01 Installation shall be performed by an applicator having five (5) years of experience in the application of these or similar materials. The manufacturer's representative shall be available to consult with the installer and the Architect as needed.
   02 Use only products of the approved manufacturer. Provide the same products for repairs as for the original coating.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Material shall be delivered to project site in manufacturer's original unopened containers.

B. Materials shall be stored indoors, protected from damage, moisture, direct sunlight and temperatures below 40°F or above 90°F.

C. Do not use drain piping for disposal of coating materials.

D. The Contractor shall take all precautions and implement all measures necessary to avert potential hazards associated with the seamless epoxy flooring system materials.

E. Deliver all materials to the job site in new, unopened containers. Each container shall bear the manufacturer's name and label.

1.6 ENVIRONMENTAL CONDITIONS

A. Surfaces and surrounding air temperatures must exceed 55°F, but must be less than 90°F, with materials at not less than 70°F during application.

B. Do not apply coating materials when dust is being generated.

C. If existing facility lighting is not adequate for flooring system application, the Contractor shall provide all temporary lighting during the work equivalent to one 200 watt explosion proof incandescent lamp per 100 square feet of work area.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Design of seamless epoxy flooring is based on products manufactured by Sherwin Williams.

A. The following manufacturers are acceptable to provide the work of this Section provided proposed products meet or exceed all specified requirements:
   01 General Polymers
   02 Dex-O-Tex
   03 Florock
   04 Polyspec
   05 Surface Solutions
   06 Key Resin Company
   07 Carboline

B. Requests for substitutions shall comply with provisions of Section 01 25 00 – Request for Substitution and must be accompanied by samples of proposed materials to match specified products.

2.2 MATERIALS

A. Seamless Epoxy Flooring: Design is based on Sherwin Williams "Resuflor Screed Deco Flake".

B. Performance Criteria:

01	Compressive Strength (ASTM C597):	9,200 PSI
02	Tensile Strength (ASTM D638):	1,650 PSI
03	Flexural Strength (ASTM C580):	4,000 PSI
04	Hardness, Shore D (ASTM D2240):	85 – 90
05	Bond Strength (ASTM D4541):	425 PSI
06	Abrasion Resistance (ASTM D4060):	80 mg
07	Volume Solids:	100%

C. Typical Application Rates:

01	Primer- Two Component:	6 – 8 mils each coat
02	Receiving Coat :	15 – 20 mils each coat
03	Broadcast – Decorative Quartz:	TBD per sample approval
04	Top Coat :	15 – 20 mils each coat

D. Provide continuous, integral coved base at walls.
   01 Finish depth of base shall match flush – 0" to (-) 1/16" - flush with ceramic wall tile finish.
   02 Field verify exact requirements and coordinate with other trades as required.
   03 Provide a stainless steel "L" trim / stop at top of base to produce a clean line between epoxy base and tile.

PART 3 - EXECUTION

3.1 GENERAL

A. Protection: Mask, cover, or otherwise protect all surfaces, equipment, and finishes not to receive the decorative epoxy flooring system specified in this Section.

B. Strictly follow the approved manufacturer's written instructions and the requirements of this Specification regarding all aspects of decorative epoxy flooring work including: mixing, application, recoat times and curing.

C. Mock-up: Prior to commencing the installation, the Contractor shall install with the owner's approval, a mutually agreed upon mock-up test sample 3' X #'to show final color and appearance of the decorative epoxy flooring system. It is the intent of the Specifications to have a Satin finish rather than a gloss finish.

3.2 PREPARATION

A. Allow new concrete to cure for a minimum of 30 days.
   01 Verify dryness by testing for moisture with a "plastic film tape-down test"; ASTM D4263

B. Shot-blast or mechanically abrade to remove laitance, curing compounds, sealers and other contaminants and to provide surface profile; ASTM D4259, ICRI CSP 4-6.

C. Vacuum clean concrete to remove all dirt, dust, and other loose materials.

D. After mechanically abrading, verify that all surfaces are clean, dry and free of any contaminants, which could adversely affect the adhesion of the flooring system.

E. If between final surface preparation work and decorative epoxy flooring system application, contamination of the prepared and cleaned substrates occurs, re-cleaning shall be required until the requirements of this Section are met.

3.3 INSTALLATION

A. Primer: The primer shall be mechanically mixed, applied and cured in strict accordance with manufacturer's printed instructions.
   01 Apply uniformly at a film thickness of 6 to 8 dry mils.
   02 Cure in accordance with manufacturer's recommendations prior to subsequent component application(s)

B. Receiving Coat: The materials shall be mixed, applied and cured in strict accordance with the manufacturer's printed instructions.
   01 Apply uniformly at a film thickness to a minimum 60 mil thickness.

02 Cure in accordance with manufacturer's recommendations prior to subsequent component application(s)

C. Finish Top Coat: high-solids, polymer finish coat shall be mechanically mixed, applied and cured in strict accordance with manufacturer's printed instructions.
01 Color shall be CU13 ¼" as selected on approved sample.
02 Apply in conjunction of broadcast quartz to replicate texture and appearance of approved sample.
03 Surface texture to minimally meet skid resistance requirements.
04 Provide tighter broadcast at all cooler and freezer locations
05 Apply at a film thickness of 15 to 20 dry mils.

D. Integral Base:
01 Coordinate with other trades to determine exact depth of tile wall finish.
02 Integral epoxy base shall be flush with tile surface within tolerance of (+) 0" to (-) 1/16"
03 Build up substrate or apply additional flooring material to achieve a flush transition.
04 Install stainless steel "L" / angle trim, continuous at top of epoxy flooring base.
05 Transition from floor to base shall be a smooth, radius cove shape; and shall be consistent throughout the room.

E. Finished epoxy flooring shall be flush with floor drain grates and other floor mounted fixtures.
01 Field verify conditions to assure fixtures are set at their finished installation heights.
02 Coordinate with other trades as required.

F. Provide stainless steel transition trim, continuous at epoxy flooring terminations at doors and other openings.
01 Verify heights of interfacing flooring as required for smooth transition.

G. Epoxy flooring installation shall result in a homogenous, even, level appearance and texture throughout the room.

3.4 CLEANUP AND PROTECTION

A. Remove waste materials, rubbish, and debris resulting from application.

B. Thoroughly clean all flooring materials from other finished materials and surfaces.

C. Protect the completed work from water, airborne particles or other surface contaminants until cured for a minimum of 24 hours after application in accordance with manufacturer's recommendations.

D. Protect from traffic, physical abuse, immersion and chemical exposure until the complete system has thoroughly cured for 24 hours at 75°F.
01 For different temperatures, consult the manufacturer's representative about curing times.
02 Minimize traffic and work subsequent to flooring installation.
03 In case of damage, immediately make all necessary repairs and / or replacements required to restore the flooring to specified requirements.

E. Arrange / schedule final inspection(s) by the manufacturer's representative to verify that all work has been installed correctly and in accordance with the manufacturer's standards and recommendations.

01 Provide written report(s) of finding(s) and determination(s).

02 Notify Architect's Field Representative of manufacturer's rep schedule site visits.

END OF SECTION

SECTION 09 68 19

CARPET

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Furnish and install all carpet as indicated or scheduled on the Drawings.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 09 65 19 – Resilient Tile Flooring
   03 All division 9 flooring sections.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each carpet finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material.
   03 Minimum size shall be 12” x 12” but must be large enough to convey attributes of the proposed product, including patterns and texture.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 WARRANTY

A. Manufacturer shall warrant the carpeting for fifteen (15) years against the following defects:
   01 Dimensional stability including curling.
   02 Edge ravel.
   03 Delamination of backing.
   04 Wear in excess of 10% by weight.

B. Manufacturer shall warrant that the generation of static electricity shall not exceed 3.5 KV at 70°F at 20% RH for the life of the carpet.

C. The carpet installer shall be required to re-lay any carpet that does not provide an attractive wrinkle-free appearance and shall correct any condition due to faulty installation which may appear for a period of one (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of carpet flooring is based on products manufactured by Tarkett.
   01 Carpet flooring is based on specific products, finishes and colors as identified on the Drawings.
   02 Substitution will be considered only if the proposed substitution is a match to the specific product(s) identified on the Drawings. Refer to section 01 25 00.

B. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
   01 Mohawk
   02 Lee
   03 Interface

2.2 MATERIALS – CARPET (FIELD)

A. Design of Carpet (Field) CPT-1 is based on Tarkett ColorMap series carpet.
   01 Carpet shall be Powerbond Roll – 72” width.
   02 Provide carpet free of any irregularities in weave or materials, and each color of one dye lot.
   03 Flammability shall meet or exceed ASTM E648 Class 1 requirements.
   04 Smoke Density shall be less than 450.
   05 Carpet shall be moth and vermin-proof, and pre-shrunk carpet.

B. Characteristics:

01	Construction:	Patterned Loop.
02	Dye Method:	100% solution dyed
03	Pattern Match:	Not required
04	Width:	72 inch roll goods.
05	Gage:	5/64 inch.
06	Tufts Per Inch:	9.6.
07	Tuft Density:	122.88 tufts per square inch.
08	Average Pile Height:	.140 inch.
09	Pile Yarn Weight:	20 ounces minimum.
10	Pile Thickness:	0.092”
11	Primary Backing:	Synthetic rubber.

2.3 MATERIALS – CARPET (ACCENT)

A. Design of Carpet (Accent) CPT-2 is based on Tarkett Fabricate series carpet.
   01 Carpet shall be Powerbond Roll – 72” width.
   02 Provide carpet free of any irregularities in weave or materials, and each color of one dye lot.
   03 Flammability shall meet or exceed ASTM E648 Class 1 requirements.
   04 Smoke Density shall be less than 450.
   05 Carpet shall be moth and vermin-proof, and pre-shrunk carpet.

B. Characteristics:

01	Construction:	Patterned Loop.
02	Dye Method:	100% solution dyed
03	Pattern Match:	Not required
04	Width:	72 inch roll goods.
05	Gage:	5/64 inch.
06	Tufts Per Inch:	9.6.
07	Tuft Density:	124.16 tufts per square inch.
08	Average Pile Height:	.141 inch.
09	Pile Yarn Weight:	20 ounces minimum.
10	Pile Thickness:	0.070”
11	Primary Backing:	Synthetic.

C. Carpet Accessories and Adhesive:
   01 Standard accessories as recommended by the successful carpet manufacturer.
   02 Carpet edge shall be vinyl overlap type for glue-down carpet.
   03 Adhesive as recommended by carpet manufacturer.
   04 Refer to section 09 65 19 – Resilient Tile Flooring for transition strips to be used at adjacent flooring materials. Coordinate as required.

2.4 MATERIALS – CARPET (LIBRARY)

A. Design of Carpet (Library) CPT-3 is based on Tarkett Tundra Flower series carpet.
   01 Carpet shall be Powerbond Roll – 72” width.
   02 Provide carpet free of any irregularities in weave or materials, and each color of one dye lot.
   03 Flammability shall meet or exceed ASTM E648 Class 1 requirements.
   04 Smoke Density shall be less than 450.
   05 Carpet shall be moth and vermin-proof, and pre-shrunk carpet.

B. Characteristics:

01	Construction:	Stratatec Patterned Loop.
02	Dye Method:	100% solution dyed
03	Pattern Match:	Not required
04	Width:	72 inch roll goods.
05	Gage:	5/64 inch.
06	Tufts Per Inch:	9.6.
07	Tuft Density:	128 tufts per square inch.
08	Average Pile Height:	.157 inch.
09	Pile Yarn Weight:	20 ounces minimum.
10	Pile Thickness:	0.076”
11	Primary Backing:	Synthetic.

2.5 CARPET ACCESSOIES AND ADHESIVE

A. Standard accessories as recommended by the successful carpet manufacturer.

B. Carpet edge shall be vinyl overlap type for glue-down carpet.

C. Adhesive as recommended by carpet manufacturer.
   01 Provide primers and other required materials necessary for the preparation of the floor slab.

D. Refer to section 09 65 19 – Resilient Tile Flooring for transition strips to be used at adjacent flooring materials. Coordinate as required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Deliver carpet to the job site in original mill scrapings, if full rolls.
   01 Store carpet elevated above the floor, under cover, and in well ventilated spaces, as soon as delivered.
   02 Allow to acclimate per manufacturer’s recommendations.
   03 Protect carpet from damage, dirt, stains, and moisture.

B. The floor slab shall be tested for moisture content to confirm slab is within acceptable limits to install carpet flooring in accordance with manufacturer’s standards and recommendations.
   01 Coordinate with the Contractor as required to lower moisture content to acceptable levels prior to installation.

C. The floor shall be clean and free of any foreign substances, such as wax, paint, oil, etc.

D. Cracks and holes shall be filled with latex emulsion filler compatible with adhesive.

E. Any ridges and high spots in concrete surface shall be brought to the attention of the Architect and the General Contractor.

3.2 INSTALLATION – ROLL GOODS

A. General:
   01 Glue directly to floor using no pad and no foam. Roll carpet with a roller to ensure maximum contact at the pressure recommended by the manufacturer.

02 Scribe carpet accurately to all vertical surfaces.
03 Align lines of carpet as woven, using no fill strips less than 15 cm (6") in width, laying all carpet in same direction unless specifically otherwise directed by the Architect.

B. Seams:
01 Locate seams only where shown on approved Shop Drawings or where otherwise approved by Architect.
02 Fabricate seams by the compression method, using a butt joint, and properly bead and seal. Do not stretch seams.
03 Brush out or roll out air bubbles toward seam.
04 Carefully apply a bead seam adhesive to the cut edge at proper height to lock in tufts and seal edge. Do not use floor adhesive to bead cut edge. Use regular seam adhesive.

C. Clean-Up:
01 Thoroughly clean all carpet surfaces prior to final acceptance of the carpeted areas by Owner. Leave work in neat, uniform condition, vacuumed and ready for use.
02 Any spillage of adhesive on the face of the carpet shall be removed immediately with a clean-up solvent recommended by the manufacturer.
03 Avoid traffic for at least twelve hours after installation.
04 Provide traffic areas with heavy Kraft paper or "Visqueen" to protect against damage and soiling.

3.3 INSTALLATION –TILES

A. Preparation:
01 Confirm dimensions at each room / area to receive carpet tiles.
02 Measured from the center of the room / area, determine layout pattern in each direction.
03 Carpet tiles shall be laid out so that edge tiles at the perimeter limits of the carpet shall be no less than 50% / 1/2 of a full tile. Adjust pattern accordingly.

B. Carpet tiles shall be laid in full stack bond fitting fully with adjacent tiles.

C. Lay tiles in linear, alternating or other pattern in accordance with submittals accepted by the Architect.

3.4 EXTRA CARPET

A. After completion of the carpet installation, the carpet subcontractor shall provide an additional 3% of total yards installed of carpet (6' wide) to the Owner for future carpet replacement that may be required. This extra stock is to be unused rolls which does not include scraps.

END OF SECTION

SECTION 09 72 13

DIGITAL WALL COVERINGS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide custom digital wall covering as indicated on the Drawings.
   02 Architect shall provide camera-ready imaging to manufacturer.

C. Related Work:
   01 Section 09 21 16 – Gypsum Board Assemblies
   02 Section 09 91 00 – Painting and Re-Painting

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Based on digital files provided by the Architect, provide full digital mock-ups of proposed graphic on each wall to receive them.
   02 Digital mock-ups shall illustrate the graphic orientation, seam locations, and true color of the proposed graphic to be installed.
   03 Minimize seams to the greatest extent possible.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Samples to be submitted by manufacturer directly to Architect/Designer of all materials specified. Do not order materials until approval is received.
   01 Submit "mini-mural" of all complete finished images printed on actual substrate used for final product. Mock up shall be minimum 3'-0" in height and represent all of the color palettes and graphics for each wall plane to receive them..
   02 Submit sample section of final image at 100% resolution printed on actual substrate used for final product.

1.3 REFERENCES

A. American National Standards Institute:
   01 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

B. Federal Specification CCC-W—408 A

1.4 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 by the Architect/Designer, if evidenced in either the submitted samples, or the manufactured material delivered to the job.

B. Applicators Qualifications: Work of this Section shall be performed by a firm regularly engaged in the installation of vinyl wall coverings of the types and qualities specified, and acceptable to the Architect/Designer.

C. All wall covering must carry the maximum UL Fire Hazard classification (ASTME-84).

D. All wall covering must be in accordance with the following performance specifications: Flame Spread – 15; Fuel Contributed – 5; Smoke Developed – 15, Type II

E. All wall covering must meet CFFA-W-101A

1.5 WARRANTY

A. Submit manufacturer's written five (5) year warranty against manufacturing defects.
   01 All wall covering 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 five (5) years from the date of acceptance of the project.
   02 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 wall covering or refund the purchase price.
   03 The foregoing limited warranty is in lieu of all other warranties, expressed or implied, written or oral.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of digital wall covering is based on products manufactured by Dreamscape.

B. Acceptable Manufacturers: the following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements:
   01 Construction Specialties
   02 Dreamscape
   03 MDC Wall Covering
   04 National Wall Covering

2.2 MATERIALS

A. Custom Digital Wall covering. Digital wall covering shall be printed on 53”/54” vinyl wall covering substrate using piezo drop-on-demand technology incorporating W-CYMK UV-cured inks.
   01 Printed image shall be dried from both front and back using combinations of IR and platen heaters to prevent media distortion.

B. Vinyl wall covering substrate: supported vinyl material, consisting of a through-pigmented, mildew-inhibitorized polyvinyl chloride, adhered to cotton, cotton/blend fabric backing, or a cellulose polyester non-woven 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.
   01 Minimum Weight: 20 oz.
   02 Backing Weight: minimum 2 ounces per square yard.
   03 Fabric backing and content: 100% recycled polyester non-woven.
   04 Adhesion of coating to fabric: 3 pounds per 1 inch strip (ASTM D751)
   05 Tensile strength: 130 X 119 (W x F).
   06 Tear strength: 39 X 41 (W x F).
   07 Flame Spread (UL): 20 (ASTM E84) or UL 723.
      a. Smoke Developed (UL): 115 (ASTM E84) or UL 723
      b. Tested on 5/8” type X gypsum board.
      c. Fire Rating – NFPA, IBC: Class A
   08 Meet Federal Specification CC-W-408, Type I

C. Adhesive: Heavy Duty Clay or Heavy Duty Clear or brands approved as equals by the manufacturer. Use primer and adhesives that are specifically recommended by the manufacturer. Provide mildew restraint and non-staining materials.

PART 3 - EXECUTION

3.1 PREPARATION

A. Check areas scheduled to receive for correct dimensions, level of substrate, and soundness of surfaces that would affect installation.

B. Contractor shall examine surface for any imperfections, if found bring to the attention of the General Contractor. Do not begin until all walls are smooth and fee of surface imperfections. Commencement of Work, will be an indication that the wall covering subcontractor accepts the scheduled walls as free of imperfections.

C. Seal Substrate surface cracks.

D. Wall Condition:
   01 The wall surface should be clean, dry, structurally sound, and free of mildew, grease, dust, or other stains.
   02 Plaster and masonry wall surfaces should not exceed 5.5% moisture when measured by a moisture meter. Gypsum board wall surfaces should not exceed 16% moisture.
   03 Room humidity should not exceed 90%.
   04 Wall surfaces should be primed with a good quality wall covering primer. Wall surfaces with significant color variation should be primed with a good quality pigmented wall covering primer.

3.2 INSTALLATION

A. Temperatures:
   01 Maintain substrate surface and ambient temperatures above 65°F, unless required otherwise by manufacturer's instructions.
   02 Do not apply adhesive when substrate surface temperature or ambient temperature is below 65°F.
   03 Maintain these conditions 72 hours before, during, and after installation of vinyl wall covering.
   04 New plaster should age 60-90 days before painting or installing wall covering.

B. Install digital wall covering in accordance with the manufacturer's instructions using heavy-duty vinyl wall covering adhesive recommended by the manufacturer (Wheat paste shall not be used). Before beginning application of vinyl wall covering confirm products for uniform color, texture and quality.

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. Request inspection by the Architect/Designer if there are variations in color or pattern that are considered to be excessive. The wall covering distributor or manufacturer's representative shall then be notified for their inspection, before any further wall covering is installed.

F. The wall covering 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 wall covering strip is applied. Use clean warm water, a natural sponge and clean towels. Change water often to maintain water cleanliness.

H. Room temperature during installation shall be between 70°F and 85°F, with RH below 65%.

I. Do not begin until all walls are smooth and free of surface imperfections.

J. Commencement of Work will be an indication that the wall covering subcontractor accepts the scheduled walls as being free of imperfections.

K. Apply one coat of primer in accordance with the printed instructions of manufacturer.

L. Before beginning application of vinyl wall covering, confirm products for uniform color, texture and quality.

M. Apply VWC vertically in lot and roll number sequences.

N. Use butt joints only (no overlapping).

O. Trim VWC to within 3/4 inch of top of scheduled base.

P. Room temperature during installation shall be between 70°F and 85°F, with RH below 65%.

3.3 CLEANING AND PROTECTION

A. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the wall covering installation. Leave areas in neat, clean and orderly condition.

B. Clean the Work of this Section in accordance with recommendations of the manufacturers of the materials used.

C. Assure that all joints have achieved continuous lamination.

D. Damaged, stained, scratched or defective materials will be rejected, and shall be replaced with new materials.

END OF SECTION

SECTION 09 84 33

SOUND-ABSORBING WALL UNITS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide sound-absorbing acoustical wall panels as indicated on the Drawings.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 09 21 16 – Gypsum Board Systems
   03 Section 09 51 13 Acoustical Tile Ceilings

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Minimum size shall be 8” x 8”, but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. American Society for Testing and Materials:
01 ASTM C423-77 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
02 ASTM E84-77a - Standard Test Method for Surface Burning Characteristics of Building Materials

1.4 QUALITY ASSURANCE

A. Provide acoustical panels of each type required from one manufacturer, of uniform texture and color.

B. Installer: Provide evidence of appropriate experience in system installation, and that installation method proposed is acceptable to panel manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Carefully protect work during shipment, storage and installation.

B. Deliver materials to job site and store elevated above floor in an enclosed space with proper ventilation and protection from damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of acoustical wall units is based on products manufactured by Acoustical Surfaces, Inc..

Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this section, provided all proposed products meet or exceed the specified requirements.
01 Guilford of Maine
02 Acoustical Resources, Inc.
03 AVL Systems, Inc.
04 Decoustics
05 Lamvin, Inc.
06 MBI Products
07 Sonotrol
08 Sound Concepts
09 Sound Solutions, Inc.
10 Wall Technology, Inc.

2.2 MATERIALS

A. Acoustical Panel Type 1 (all panels over 7 feet above finish floor):

01 Fiberglass core: 7 lb PCF with chemically-hardened beveled edges.
02 NRC-.75.
03 Fire Rating: Class A ASTM E84; flame spread shall be less than 25.
04 Attach with manufacturer's clip system for permanent wall mounting. Provide alternate fastening where top clearance is 0".
05 Size and shape shall be as indicated on Drawings.
06 Edge Condition: Beveled.

B. Acoustical Panel Type 2 (all panels under 7 feet above finish floor):
01 Type: Absorber Panels.
02 Semi-rigid glass fiber core faced with 1/8 inch thick compressed fiberglass.
03 NRC-.75.
04 Fire Rating: Class A ASTM E84; flame spread shall be less than 25.
05 Attach with manufacturer's clip system for permanent wall mounting. Provide alternate fastening where top clearance is 0".
06 Size and shape shall be as indicated on Drawings.
07 Edge Condition: Beveled.

C. Acoustical Panel Thicknesses: As indicated on the Drawings.

D. Acoustical Panel Fabric Face: Design is based on products manufactured by Giilford of Maine; or other equal products submitted and accepted by Architect during proposal phase.
01 100% Polyester.
02 Minimum 16 oz. per square yard.
03 Colors as selected by the Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Store in a dry, elevated location in air conditioned environment.

B. Field verify all dimensions as required to assure accurate fit / installation of acoustical wall panels without modifying in the field.

3.2 INSTALLATION

A. Install panels only after all wet work has been completed, and temperature conditions (approximate conditions), when space will be occupied.

B. Install panel plumb, in proper alignment, and in strict accordance with manufacturer's instructions and approved Shop Drawings. Shim wall track as necessary to provide a level frame work, provide spot adhesive to secure panels from movement if clip installation methods are used.

C. Arrange wall panels symmetrically on each wall, unless otherwise indicated. Lay out so that no panel is less than one-half the width of the typical panel, unless otherwise indicated on Drawings.

D. Remove and replace panels which are damaged and unacceptable to Architect.

END OF SECTION

SECTION 09 91 00

PAINTING AND RE-PAINTING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Work under this Section includes furnishing all labor, material, equipment and accessories necessary for completion of all painting and staining.
   02 Refer to Paragraph 3.1 for list of items to receive paint.
   03 Fully coordinate with all other subcontractors as required to include all painting that may be included in other sections of specifications.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 05 50 00 – Metal Fabrications
   03 Section 05 51 00 – Metal Stairs
   04 Section 05 52 13 – Pipe and Tube Railing
   05 Section 06 20 00 – Finish Carpentry
   06 Section 09 21 16 – Gypsum Board Assemblies

D. Work Not Included:
   01 Shop coat of paint on metal, unless noted otherwise. Exception: Shop coated / primed metal components which have had primer removed due to repair of the component (i.e. hollow metal doors frames, etc.) shall be re-primed in the field prior to application of finish painting.
   02 Aluminum and copper, unless noted otherwise.
   03 Factory finished materials, products and equipment furnished with acceptable finish.
   04 Plastic clad educational equipment.

1.2 RESPONSIBILITY OF COORDINATION

A. Coordinate the Work specified herein with the following Work:
   01 Provide information to preceding trades for proper preparation of substrate.
   02 Inspect substrate before proceeding to verify proper preparation.
   03 Notify Architect of any item to receive paint which may not be covered by a scheduled finish type. Architect will furnish appropriate specification.

1.3 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Product data shall include test certificates / reports, other certifications and applicable documentation to demonstrate compliance and as required by the specification.

C. Samples: Submit full range of colors, patterns, textures and finishes available for selection, including the following:
   01 Color Chips: Provide complete duplicate sets of color chips for color selection.
   02 Small Applied Samples: Provide pieces of actual material on which paint will occur with minimum dry mil thickness of specified paint.
   03 Sheen Samples: Provide full range of varying sheens when sheens are controllable by intermixing.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including preparation, for all products and / or assemblies proposed to be furnished.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Installed Samples: Provide large size samples for approval. Approved samples may be left in place as part of the Work.
   01 Interior: One room and/or area, as selected by the Architect, shall be painted with materials specified or accepted and applied directly from container, un-thinned. After acceptance by Architect, room and/or area shall be standard of quality of entire project.
   02 Exterior: Three samples, 4'x4' each, of all exterior finishes, provided at the job site. Samples should represent each substrate. After acceptance by Architect, samples shall be standard of quality of entire project.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.4 QUALITY ASSURANCE

A. Materials shall be applied directly from containers in which material is purchased. No exceptions.

B. Subcontractor shall provide to Owner and Architect a notarized certification that paint used is as specified in writing by the Architect.

C. Number of coats of each of several finishes shall be in accordance with detailed Specifications, which will produce first quality finish if properly applied.
   01 If number of coats specified fails to produce a finish acceptable to Architect, this Contractor shall apply additional coat(s) at his own expense until an acceptable finish is achieved.

D. At painted CMU walls in food service, culinary and other similar health-sensitive areas, the application of the paint system and final finish shall fill voids and

irregularities in the CMU and produce a substantially smooth, easily cleanable surface acceptable to the Authority Having Jurisdiction.

E. Provide primers and other undercoat paints produced by same manufacturer as finish coats. Use thinners recommended by paint manufacturer's printed instructions.

F. Deliver products to jobsite in unbroken containers bearing manufacturer's labels, intact and legible at time of use.

1.5 WARRANTY

A. The undertaking of a painting subcontract will indicate that the subcontractor will warrant the Work specified herein for two (2) years against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials or workmanship.

B. Defects shall include by not be limited to the following:
   01 Discoloring noticeably by yellowing, streaking, blooming, changing color or darkening.
   02 Mildew.
   03 Peeling, cracking, blistering, alligatoring or releasing from the substrate.
   04 Chalking or dusting excessively.
   05 Changing sheen in irregular fashion.
   06 Change in sheen and / or color resulting from re-application of paint using a different application method than use on original coating(s) (i.e. brush touch-up on a surface originally sprayed).
   07 Softening or becoming tacky.
   08 Bubbling.

C. In the event of damage, immediately make all repairs and replacements necessary for approval of the Architect, and at no additional cost to the Owner.

1.6 PRODUCT HANDLING

A. Store only approved materials at the jobsite, storing only in a suitable and designated area restricted to the storage of paint materials and related equipment.

B. Temperature in the storage area shall be between 40°F and 110°F. Open and mix all materials in the storage area.

C. Use all means necessary to protect materials before, during, and after application, and to protect the installed work and materials of all other trades.

D. Apply water-based paints only when temperature of surfaces to be painted, and surrounding air temperatures are between 50°F (10°C) and 90°F (32°C), unless otherwise permitted by paint manufacturer's printed instructions.

E. Apply solvent-thinned paints only when temperature of surfaces to be painted, and surrounding air temperatures are between 45°F (7°C) and 95°F (35°C), unless otherwise permitted by paint manufacturer's printed instructions.

F. Do not paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions. Painting may be continued during inclement weather, if

areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer, during application and drying periods.

1.7 EXTRA STOCK

A. Upon completion of the Work of this Section, deliver to the Owner, an extra stock equaling 10 percent or a minimum of 1 gallon, whichever is greater, of each color, type, and gloss of paint used in the Work.
   01 Make sure each container is tightly sealed, clearly labeled with contents, and location where used.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. All paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer and shall, as a system, have flame spread, fuel contribution, and smoke density test results less than 25.

B. Paint materials listed herein, unless otherwise designated in the "Painting Schedule", are the products of Sherwin Williams., and require no further approval as to manufacturer or catalogue number.

C. Similar first line material of one of the following manufacturers may be used subject to approval by the Architect for items indicated to be coated with Sherwin Williams materials:
   01 PPG
   02 Benjamin More

2.2 EXTERIOR PAINT MATERIALS

A. The following is a Specification of typical exterior painted items and does not specifically include every item that is to receive paint.
   01 All listed products and paint systems are products of Sherwin Williams.
   02 It should, however, establish type and quality of finish for all items normally included in a complete paint job.

B. Exterior Galvanized Metal:
   01 1 coat – SW Pro-Cryl Universal Water Based Primer B66-310 Series. 2.0 – 4.0 mils DFT.
   02 2 coats – SW DTM Acrylic Gloss Coating B66W100 Series. 2.5 – 4.0 mils DFT each coat.

C. Field Weld Touch-up on Galvanized Metal:
   01 1 coat – SW Pro-Cryl Universal Water Based Primer B66-310 Series. 2.0 – 4.0 mils DFT.
   02 2 coats – SW DTM Acrylic Gloss Coating B66W100 Series. 2.5 – 4.0 mils DFT each coat.

D. Ferrous Metals:
   01 1 coat – SW Pro-Cryl Universal Water Based Primer B66-310 Series. 2.0 – 4.0 mils DFT.
   02 2 coats – SW DTM Acrylic Gloss Coating B66W100 Series. 2.5 – 4.0 mils DFT each coat.

E. Exterior Wood:

01 1 coat – SW A-100 Alkyd Wood Primer Y24W20. 2.3 mils DFT.
02 2 coats – SW DTM Acrylic Gloss Coating B66W100 Series. 2.5 – 4.0 mils DFT each coat.

F. Exterior Concrete Masonry Units:
01 2 coats – SW Loxon XP Exterior Waterproofing System A24-1400 Series, 6.4 – 8.3 mils DFT each coat.

G. Exterior Concrete Tilt-Wall – Smooth Coating:
01 1 coat – SW Loxon XP Waterproofing Coating A24-100 Series, 6.4 – 8.3 mils DFT.
02 2 coat – SW Conflex XL High Build Smooth, A05W00451, 6.0 – 7.5 mils DFT each coat.

H. Exterior Concrete Tilt-Wall – Medium Textured Coating:
01 1 coat – SW Loxon XP Waterproofing Coating A24-1400 Series, 6.4 – 8.3 mils DFT.
02 1 coat – SW Conflex XL High Build Medium Texture, A05W00810, 9.4 – 11.0 mils DFT.

I. Exterior Plaster (designated “Acrylic Finish”):
01 1 coat – SW Loxon Conditioner A24-100.
02 2 coats – Sherwin Williams UltraCrete Textured Masonry Topcoat A44 Fine Texture, 6.0 mils DFT.

J. Exterior Traffic Marking Paint:
01 1 coat – SW Setfast Solventborne Acrylic Traffic Parking Paint, 15.0 mils WFT, 7.2 mils DFT.

2.3 INTERIOR PAINT MATERIALS

A. The following is a Specification of typical interior painted items and does not specifically include every item that is to receive paint.
01 All listed products and paint systems are products of Sherwin Williams.
02 It should, however, establish type and quality of finish for all items normally included in a complete paint job.

B. Interior Gypsum Drywall and Ceilings – Enamel Finish:
01 1 coat – SW Promar 200 Zero VOC Latex Primer B28W02600. 1.1 mils DFT.
02 2 coats – SW Promar 200 Zero VOC Latex B24-2600 Series. 1.4 mils DFT each coat.

C. Interior Gypsum Drywall and Ceilings – Epoxy Finish:
01 1 coat – SW Preprite 200 Latex Primer B28W200. 1.1 mils DFT.
02 2 coats – SW Water Base Catalyzed Epoxy B70 / B60. 3.0 mils DFT each coat.
03 Use at bathrooms, locker rooms, showers, science labs, food service areas, and other moist / wet areas.

D. Interior Galvanized Metal:
01 1 coat – SW ProCryl Water Based Universal Primer B66-310 Series. 2.0 – 4.0 mils DFT.
02 2 coats – SW ProClassic Waterborne Acrylic S/G Enamel B31W51 Series. 1.4 mils DFT each coat.

E. Interior Non-Galvanized Metal:

01 1 coat – SW ProCryl Water Based Universal Primer B66-310 Series. 2.0 – 4.0 mils DFT.
02 2 coats – SW ProClassic Waterborne Acrylic S/G Enamel B31W51 Series. 1.4 mils DFT each coat.

F. On Metal with Shop Coat, use:
01 Touch-up Shop Coat with SW ProCryl Water Based Universal Primer B66-310 Series, 2.0 – 4.0 mils DFT.
02 2 coats – SW Pro Classic Interior Alkyd Semi-Gloss B34 Series.
03 Used for hollow metal door / window frames and miscellaneous steel items.

G. On steel joists and wood fiber decks:
01 Coordinate with manufacturer for preparation and application on existing assemblies.
02 Prime as required with primer as recommended by the manufacturer for rusting surfaces, peeling paint etc.
03 2 coats - SW Dry Fall - Waterborne Acrylic Dry Fall, B42W1, 3.5 mils DFT each coat.

H. Interior CMU – Enamel Finish:
01 2 coats - SW Loxon Block Surfacer A24W200. 8.0 mils DFT each coat.
02 2 coats – SW ProClassic Waterborne Acrylic S/G Enamel B31W51 Series. 1.4 mils DFT each coat.

I. Interior CMU - Epoxy Finish – Wet Areas:
01 2 coats – SW Kem Cati-Coat Filler B42 Series. Total 15 to 25 mils DFT. As required to fill voids and provide a continuous surface.
02 2 coats – SW Water Base Catalyzed Epoxy B70 / B60. 3.0 mils DFT each coat.
03 Use at showers, food service areas, and other moist / wet areas as indicated.

J. Interior CMU - Epoxy Finish – Dry Areas:
01 2 coats Loxon Block Surfacer A24W200. Total 16 mils DFT as required to fill voids and provide a continuous surface.
02 2 coats – SW Water Base Catalyzed Epoxy B70 / B60. 3.0 mils DFT each coat.

K. Interior Wood – Enamel:
01 1 coat – SW Preprite Classic Latex Primer B28W101. 1.6 mils DFT.
02 2 coats - SW ProClassic Waterborne Acrylic S/G Enamel B31W51 Series. 1.4 mils DFT each coat.

L. Interior Wood – Stained Transparent Finish:
01 SW Wood Classics Stain A49 Series. Coordinate with Architect for specific stain color, application and final appearance to be used for each interior wood stained surface.
02 2 coats - SW Wood Classics Polyurethane Varnish A67 Series, 1.7 mils DFT each coat.

2.4 COLORS

A. Where specific finished paint colors are indicated or scheduled on the Drawings, provide paint colors accordingly.

B. Where specific finished paint colors are not indicated or scheduled on the Drawings, different colors may be selected for each room, and more than one color may be selected in each room.

C. Multiple paint colors and / or patterns on a single wall or plane shall be as indicated on the Drawings.

D. All piping in mechanical rooms shall be painted in their entirety in accordance with the following color schedule:

01	Natural Gas	Orange
02	Domestic Cold Water	White
03	Domestic Hot Water	Pink
04	Heating Hot Water	Red
05	Condenser Water	Green
06	Chilled Water	Blue

PART 3 - EXECUTION

3.1 ITEMS TO RECEIVE PAINT

A. Generally, all unfinished items that are normally painted in any typical building, including but not limited to the following list:

01 All ferrous metal including exposed steel structure; excluding mechanical and equipment rooms.

02 All exposed exterior steel; including masonry lintels, exposed steel structure, handrails and other exterior steel components.

03 All exterior wood.

04 All interior wood.

05 All conduit, outlet boxes and electrical cabinets exposed within a user occupied rooms; excluding those located in mechanical / electrical rooms.

06 All exposed pipe, plumbing and ductwork, including those located in mechanical rooms.

07 All new metal grilles, except aluminum, unless otherwise indicated.

08 All new exposed gypsum board surfaces, including all mechanical rooms.

09 All exposed exterior concrete masonry units, including all mechanical rooms.

10 All exposed interior concrete masonry units, including all mechanical rooms.

11 All exposed cementitious wood fiber materials at roof deck and walls.

12 Miscellaneous other items which normally require painting or are scheduled to be painted.

13 Consult plans, finish schedule, details and specifications for other trades as all items usually field-painted or finish will be considered as part of the Contract.

14 All new exposed mechanical equipment and electrical equipment.

15 Any other material that is exposed to view that is not prefinished.

B. All work where a coat of material has been applied must be inspected and approved by the Architect, before application of succeeding specified coat, otherwise no credit for coat applied will be given.

01 Notify Architect when a particular coat has been completed for inspection and approval.

02 Apply coats of material in strict accordance with manufacturer's specifications, except where requirements of these specifications are in

excess of manufacturer's requirements. Paint all sight exposed pipe and plumbing, only after all mechanical work and tests have been completed.

3.2 PREPARATION

A. Preparation of materials shall be in accordance with the manufacturer's standards and / or recommendations for the paint products / systems specified for each material.
   01 Field verify all conditions and requirements and coordinate with manufacturer as required for a proper installation.

B. General: Surface must be clean to ensure adhesion. Remove oil and grease with paint thinner. Wash off dirt with warm soapy water and rinse with clean water. Remove rust by wire brushing or sanding.

C. Unfinished Surfaces:
   01 Wood: Sand smooth and apply one coat of primer undercoat. After primer has dried overnight, putty nail holes and cracks, then spot-prime putty with primer. Again, allow the primer to dry overnight, sand lightly and topcoat.
   02 Masonry and Concrete: Remove form release compounds, efflorescence or cement dust on masonry and concrete by etching with a 10% solution or muriatic (Hydrochloric) acid. Power wash surface after etching with clean water, and paint while still damp, but within manufacturer's moisture tolerance. On surface where muriatic acid cannot be used to neutralize the efflorescence, remove the efflorescence by sanding, scraping or wire brushing, and apply a coat of masonry conditioner before painting. Fill voids and pores in concrete masonry and other porous masonry materials with latex block filler and allow to dry overnight before top coating.
   03 Iron and Steel: Prime with metal primer and allow to dry overnight before top coating.
   04 Galvanized Metal: Prime with galvanized metal primer and allow to dry overnight before top coating.

3.3 APPLICATION

A. General: Surfaces to be finished must be clean, dry, and free of dirt, oils, loose paint or any other contamination that would adversely affect adhesion, protective properties or appearance of the coating.

B. Allow exterior paints to dry 72 hours between coats and interior paint to dry 24 hours between coats.
   01 Allow all enamels and varnishes to dry 24 hours between coats. If enamel and varnishes are tacky after 24 hours, allow additional time until finish is dry.

C. Leveling: Apply with proper consistency and quality so paint flows out to a level surface free of brush and roller marks, bubbles, dust, runs, sags, and holidays. Spread evenly.

D. Appearance: Uniform color, texture and sheen.

E. Acrylic coating on concrete tilt-wall system to be applied with 1000psi airless sprayer with heavy duty texture gun.

F. Neatness: Paint shall not be smeared, spattered or run over adjoining colors or materials. Cut-on lines shall be straight.

G. First coat shall be white, unless otherwise specified.

END OF SECTION

SECTION 09 94 26

PLASTIC LAMINATE CLAD COLUMN COVERS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Furnish all material necessary for a complete installation of Plastic Laminate Clad Column Covers as indicated on the Drawings..
   02 Column covers to be self-aligning, positive interlock, without exposed fasteners or supports.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 05 12 00. – Structural Steel Framing
   03 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.

01 Include recommended cleaning products and instructions for use.
02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
01 Provide two (2) samples of each finish for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.
04 Composite Sample: Submit samples of selected tile and grout mounted on a minimum 12" x 12" board, or larger if necessary, indicating tile pattern / installation, joint size and grout color.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 QUALITY ASSURANCE

A. Manufacturer to have a minimum of ten (10) years of experience in the manufacturing of column covers.

B. Manufacturer shall inspect all aspects of the project conditions to ensure that specifications have been met, and that they comply with reviewed Shop Drawings.

C. Provide all finish materials in protective wrapping; and in as much is practical leave in place until final cleaning prior to Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Plastic Laminate Clad Column Covers is based on products manufactured by Pittcon Industries.

B. The following manufacturers are acceptable provided the products proposed for use are equal to the basis of design products, including color if specific products as identified on the Drawings and / or finish schedules.
01 Specified Components, Inc.
02 Crossville

C. Plastic laminate cladding shall be selected from the full range of selections from one of the following manufacturers:
01 Wilsonart
02 Formica
03 Nevamar

2.2 MATERIALS

A. Design of Plastic Laminate Clad Column Covers is based on Pittcon Industries series 8500 Column Covers.

B. Covers shall be roll formed 0.090” aluminum substrate clad with plastic laminate.

C. Provide base and reveal configuration(s) as indicated on the Drawings.
01 Pittcon Series 1500 Snap Form Column Covers, butt joints.

D. All fasteners are to be concealed.

E. All support structures to be supplied by column cover manufacturer and shall be suitable for the type(s) of structural steel columns at indicated locations.

F. All column covers are to be shipped with protective material on all exposed surfaces.

G. Pittcon Series 1500 Snap Form Column Covers, butt joints.

2.3 FABRICATION

A. Column covers shall be roll-formed to specific dimensions and tolerances, and accurately formed to radii shown on Drawings.

B. Column covers shall be fabricated in two vertically-divided sections attached with a demountable interlock joint.

C. Column covers shall be fabricated in single length heights of 16' where required, with the addition of stacking joints to allow for heights above 16'.

PART 3 - EXECUTION

3.1 INSPECTION AND INSTALLATION

A. Contractor to inspect column covers upon receipt to ensure that no damage has occurred during shipment.

B. Column cover to be correctly oriented and installed in accordance with manufacturer's Shop Drawings and installation instructions to ensure proper installation.

C. Column cover to be erected plumb and level.

3.2 CLEANING AND PROTECTION

A. Contractor to remove protective material supplied by column cover manufacturer.

B. Contractor to clean all visible surfaces after installation.

C. Contractor to protect column covers from damage by other trades.

END OF SECTION

SECTION 10 10 00

MISCELLANEOUS SPECIALTIES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Pasadena Fire Department Know Box
   02 Marquee Sign Readerboard.
   03 TV Brackets.
   04 Televisions.
   05 Bike Rack.
   06 Changing Table.
   07 Wall Bracket Cable Anchors.

C. Related Work:
   01 Section 10 44 00 – Toilet, Bath and Laundry Accessories

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

PART 2 - PRODUCTS

2.1 KNOX BOX

A. Provide Knoxbox Model 3200 in accordance with Pasadena Fire Marshal Office.
   01 No Substitutions

B. Provide in quantities and locations as indicated on the Drawings.

2.2 MARQUEE READERBOARD

A. Design of marquee reader board is based on United Visual Products “Single Face Fully Illuminated Heavy-Duty Outdoor Enclosed Readerboard.

B. The following manufacturers are acceptable to provide marquee readerboards provided proposed products meet or exceed all specified requirements.
   01 Best-Rite
   02 Stewarts Signs

C. Materials / Construction:
   01 Size: 73-1/4” x 48”.
   02 Single, top hinged, lockable door / face panel.
   03 Fully illuminated 120 V fluorescent lighting. Coordinate with electrician for locating power receptacle connection.
   04 Cabinet constructed of .125” and .1875” aluminum extrusions with welded joints.
   05 Door shall be constructed of a 2” aluminum framed extrusions with 1/4" clear polycarbonate view panel.
   06 Finish at all aluminum shall be powder coat paint finish in color as selected by the Architect from manufacturer’s full range of colors.

D. Lettering:
   01 The top portion of the readerboard shall contain the name of the school name with fixed lettering.
   02 School lettering shall be nominal 8” tall cast plastic letters permanently fixed to reader board. Allow a maximum of 18 letters.
   03 Below the school name lettering, provide 3” to 4” cast plastic letters reading ELEMENTARY SCHOOL. Size dependent on scale and name of school.
   04 Below the fixed letters, provide five (5) lines for 4” clear plastic letter inserts.
   05 Provide a minimum of 300 capital letters / numbers in industry standard ratios.
   06 Provide organizational case for letter inserts.

2.3 TV BRACKETS

A. Design of TV brackets is based on products manufactured by Solidmounts.

B. The following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements:
   01 Digicom
   02 Peerless
   03 Sanis

C. Design of TV brackets is based on Solidmounts Model UA-600 Articulating Swing-Arm Wall Mount for 32" to 52" Displays.
   01 Full swivel and tilt (minimum 5 degrees up and 15 degrees down) capabilities.
   02 Minimum arm extension from wall: 16".
   03 Weight capability: up to 150 pounds.
   04 Vesa: Industry standard Vesa to be specified by Owner prior to ordering.
   05 Finish: black.
   06 **Lifetime warranty** against manufacturer's defects.

D. Locations: provide TV brackets at the following locations:
   01 Entry Lobby.
   02 Principal Office.
   03 Assistant Principal Offices.
   04 Staff Lounge.
   05 Dining Area / Cafeteria – two (2).
   06 Provide three (3) additional TV brackets to be located by the Architect.

E. Verify exact location of all TV Brackets with Architect prior to installation of wood blocking.

2.4 TELEVISIONS

A. Design of televisions is based on products manufactured by LG Electronics.

B. The following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements:
   01 Samsung
   02 Sony
   03 Vizio

C. Design of 55" televisions is based on LG Electronics model 55UH8500 55" Class Super UHD 4K Smart LED TV with webOS 3.0.

D. Design of 65" televisions is based on LG Electronics model 65UH8500 65" Class Super UHD 4K Smart LED TV with webOS 3.0.

E. Features:
   01 Flat screen.
   02 Screen Size:
      a. 55" class - 54.6" diagonal.
      b. 65" class – 64.5" diagonal.
   03 Ultra HD – 3840 x 2160.
   04 TruMotion 240Hz.
   05 IPS 4K Display.
   06 HDR Super with Dolby Vision.
   07 True Black Panel.
   08 Interconnectivity: webOS 3.0.
   09 Energy Star Qualified.

2.5 BIKE RACKS

A. Design of bike racks is based on products manufactured by Pilot Rock / R.J. Thomas Manufacturing Co.

B. The following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements:
   01 Custom Playground Products
   02 Jay Pro

C. Design of bike racks is based on Pilot Rock Model BR210SS Vertical Bike Rack – D-Shaped End Frame with Single Side Parking.
   01 Each rack has capacity of 10 bikes.
   02 Nominal Size: 150”L x 23”W x 33”H.
   03 Primary framing: 1-1/2” x 10-gauge pipe.
   04 Vertical Stall Bars: 5/8” O.D. steel bar.
   05 Stall section shall be all welded construction.
   06 All assemblies shall be hot dip galvanized.
   07 Provide hardware to anchor bike racks to concrete flatwork.

D. Locations: Provide three (3) bike racks as indicated on the Drawings.

2.6 CHANGING TABLES

A. Design of changing tables is based on products manufactured by Infinity.

B. The following manufacturers are acceptable to provide products of this Section provided proposed products meet or exceed all specified requirements:
   01 Armedica
   02 Keizer Manufacturing

C. Design of changing tables is based on Infinity Model ADS-IN MC 7227 Electric Adjustable Changing Table.
   01 Nominal Size: 72”L x 27”W.
   02 Steel frame with powder coat finish.
   03 Platform adjustable from 18” to 37”.
   04 Platform: Vinyl material on 1-1/2”.
   05 Provide retractable side rails.
   06 Weight capacity: 450 LBS.
   07 Motor: 120V.
   08 Provide with foot operator.

D. Locations: Provide one (1) changing table at each Changing Room.

2.7 WALL BRACKET CABLE ANCHORS

A. Design of wall bracket cable anchors is based on y SecurTech “Secure Anchor Point”.

B. Other manufacturers providing equal products shall be considered for use.

C. Function and Use:
   01 The function of the wall bracket cable anchors is to secure a 1/4" to 3/8” diameter cable through a closed loop.
   02 Brackets shall be wall mounted with two (2) minimum #10 x 2” flathead screws, anchored to 2x wood blocking anchored to wall studs.

D. Quantity and Locations:
   01 Wall bracket cable anchors shall be installed in all student teaching rooms / spaces.
   02 Coordinate with Architect for exact locations.
   03 Provide a total of sixty-six (66) brackets.

PART 3 - EXECUTION

3.1 INSTALLATION – MARQUEE READERBOARD

A. Install in strict accordance with manufacturer's installation instructions and recommendations specific to this installation.

B. Coordinate with other trades as required for proper rough opening and interface of marquee reader board cabinet inset into marquee masonry wall.

C. Coordinate with electrical contractor for location and connection of 120 V power connection.

D. Install marquee reader board cabinet in masonry rough opening.
   01 Verify cabinet is set level and plumb. Shim as required.
   02 Firmly anchor in place.

E. Check door for smooth and proper operation after installation.

F. Provide continuous sealant at perimeter of readerboard cabinet at masonry.

3.2 INSTALLATION – TV BRACKETS

A. Coordinate with other trades as required to assure solid wood blocking is installed at the proper location(s) for secure attachment of TV brackets.

B. Mount TV brackets in strict accordance with manufacturer's standards and recommendation.

3.3 INSTALLATION – TELEVISIONS

A. Locations: Provide televisions at locations shown in plan.

B. Coordinate with other trades as required for the proper location of electrical power and data interface with televisions.

END OF SECTION

SECTION 10 11 16

MARKER BOARDS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide fixed dry erase marker boards as indicated on the Drawings.
   02 Marker boards shall be complete with all trim and accessories specified and / or shown on the Drawings.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   03 Section 09 21 16 – Gypsum Board Assemblies
   04 Section 10 11 23 – Tack Boards

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. ASTM International:
   01 ASTM E84 – Standard Test Method for Surface Burning Characteristics for Building.
   02 Materials ASTM B221 – Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

B. American National Standards Institute (ANSI):
   01 ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

C. Porcelain Enamel Institute:
   01 PEI-1002 Manual and Performance Specifications for Porcelain Enamel Writing Surfaces.

D. GreenGuard environmental Institute:
   01 GreenGuard Certified. UL2818-2013 Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of marker boards is based on products manufactured by Claridge.

B. The following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Alliance Wall Corporation
   02 Best-Rite
   03 Greensteel
   04 Eberhard Faber
   05 Nelson Adams
   06 TacRite

2.2 FIXED MARKER BOARDS

A. Design is based on Claridge "LCS Deluxe Porcelain Whiteboards" liquid chalk writing system with magnetic surface.
   01 Material: 1/2 inch thick; three components, 24-gauge porcelain enameled on steel face, 1/2 inch core “Duracore”, and .015 aluminum sheet backing.
   02 Color: Porcelain plus 11096 medium gloss.
   03 Refer to drawings for elevation, locations, and sizes.
   04 All marker boards shall be factory built.
   05 Locations: Where indicated on the Drawings.
   06 Size(s): As indicated on the Drawings.

B. Trim:
   01 Marker Trough: Similar to Claridge Series 1, Type A, chalk trough under all marker boards.
   02 Map Rails: Similar to Claridge Series 1, Type A. Provide map rail across top of all marker boards.
   03 Spring Clips: Similar to Claridge No. 76M; provide four (4) per room where marker boards occur.

04 Roller Brackets: Similar to Claridge No. 76 R.B.; provide one set at each marker board.
05 Flag Holder: No. 76 F.H.; provide two (2) per marker board.
06 Miscellaneous Trim: Provide closer and end cap pieces at their termination.

C. Mounting: Mount factory assembled boards with mounting clips only; no adhesive is to be used. Mount all marker boards at 34" AFF to chalk rail.

D. Markers: Provide 12 markers per liquid chalk writing surfaces. Three each black, blue, red and green.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate with other trades as required for installation of blocking in walls to secure the marker board support brackets.

B. Sliding marker board assembly shall be mounted over / around an interior window as indicated on the Drawings.
01 Coordinate all trades as required for proper installation and interface with window frame.

C. All marker boards and accessories shall be installed in strict accordance with manufacturer's printed instructions.

D. Provide all grounds, brackets, anchors, trim, and accessories for a complete installation.

END OF SECTION

SECTION 10 11 23

TACK BOARDS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all tack boards as indicated on the Drawings.
   02 Provide all tack strips as indicated on the Drawings.
   03 Provide all tack board assemblies as indicated on the Drawings

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 09 21 16 – Gypsum Board Assemblies
   03 Section 10 11 16 – Marker Boards

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. ASTM International:
   01 ASTM E84 – Standard Test Method for Surface Burning Characteristics for Building.
   02 Materials ASTM B221 – Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

B. GreenGuard environmental Institute:
   01 GreenGuard Certified. UL2818-2013 – Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of tack boards is based on products manufactured by Claridge.

B. The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 ASI Group
   02 Best-Rite
   03 Carolina Specialties
   04 Moore Company
   05 Nelson Adams
   06 Peninsular Slate

2.2 MATERIALS

A. Factory Built Tack Board (TB):
   01 Design of tack board is based on Claridge 800 Series Tack Boards.
   02 Frame:
      a. Type 6063 alloy grade aluminum with T5 tempering in accordance with ASTM B221, with 201-R1 satin anodize finish.
      b. Aluminum frame with 5/8” face trim (Type CO).
   03 Tack Surface: Claridge “Fabricork” vinyl plastic mounted on 1/4 inch resilient cork over 1/4 inch hardboard underlayment (1/2 inch total thickness).
   04 Patterns and colors as selected by the Architects from manufacturer’s full range of standard colors.
   05 Size: 48” height by length indicated on the drawings. Where no length is indicated, provide 72” units.

B. Mounting:
   01 Mount factory assembled boards with mounting clips only; no adhesive is to be used.
   02 Mount all tack boards at 34" AFF.

C. Tack Strip:
   01 Design is based on Claridge Hang-Tight Rail System 79.
   02 Tackable cork strip insert.
   03 Insert extrusion at bottom.
   04 Size: 2” height; 1-1/8” depth.
   05 Length: full length of associated marker board. Provide at all marker boards.

D. Stand-Alone Tack Strip:
   01 Design is based on Claridge Hang-Tight Rail System 79.
   02 Tackable cork strip insert.
   03 Insert extrusion at bottom.
   04 Size: 2” height; 1-1/8” depth.
   05 Length: 96”.

E. Tack Board Assemblies
   01 Design is based on Claridge Edge Wrapped Tackboard
   02 Assembly shall be comprised of individual tack boards in sizes and configurations as indicated on the Drawings.
   03 Tackable surface shall be Giilford fabric or Claridge Fabricork in colors / finishes as indicated on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate with other trades as required for installation of blocking in walls to secure the tack board support brackets.

B. All tack boards and accessories shall be installed in strict accordance with manufacturer’s printed instructions.

C. Provide all grounds, brackets, anchors, trim, and accessories for a complete installation.

D. Mount tackable wall surface to wall substrate in strict accordance with manufacturer’s standards and recommendations.

END OF SECTION

SECTION 10 11 36

VISUAL DISPLAY CONFERENCE UNITS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTIO.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide visual display conference units where indicated on the Drawings.

C. Related Work:
   01 Section 09 21 16 – Gypsum Board Assemblies
   02 Section 10 11 16 – Marker Boards
   03 Section 10 11 23 – Tack Boards

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish of each material for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3”, but must be large enough to convey attributes of the proposed product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of visual display conference units is based on products manufactured by Claridge.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provided all proposed products meet or exceed the specified requirements.
   01 Egan
   02 Ghent

2.2 VISUAL DISPLAY CONFERENCE UNIT

A. Design of visual display conference units is based on Claridge Contemporary Style Lecture Cabinets in stained wood finish.
   01 Provide in stained cherry wood.
   02 Size: nominal 48” x 48”

B. Features
   01 LCS-II low gloss porcelain enamel steel writing surface.
   02 Quartz Designer Fabric tack boards inside doors.
   03 Provide display rail with cork insert.
   04 Provide spring clip hooks for tacking or hanging large format stock.

C. Mounting: Concealed Z-bar hangers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate with other trades as required for installation of blocking in walls to secure the visual display unit.

B. All visual display units shall be installed in strict accordance with manufacturer’s printed instructions.

C. Provide all grounds, brackets, anchors, trim, and accessories required for a complete installation.

END OF SECTION

SECTION 10 12 00

MANUFACTURED DISPLAY CASES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide prefabricated display cases in sizes and locations as indicated on the Drawings.
   02 Provide integral lighting as indicated on the Electrical Drawings.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 06 10 00 – Rough Carpentry
   03 Section 06 20 00 – Finish Carpentry
   04 Section 08 80 00 – Glazing
   05 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. ASTM International:
   01 ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   02 ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
   03 ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of display cases is based on products manufactured by Claridge Products and Equipment.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Educational Equipment
   02 Platinum Visual Systems
   03 Waddell Display Cases

2.2 MATERIALS – RECESSED DISPLAY CASES

A. Design of recessed display cases is based on Claridge series 390 Recessed Display and Trophy Cases.
   01 Provide in widths as indicated on the Drawings.

B. Aluminum:
   01 Trim shall be heavy gauge extruded aluminum and shall meet or exceed ASTM B221 alloy standards.

C. Wood Cabinet:
   01 Fabricate using 3/4" minimum type M2 medium density fiberboard (MDF) surfaced with horizontal grade laminate.
   02 Laminate shall be as selected by Architect from manufacturer’s full range of standard selections.
   03 Depth shall be 18”.

D. Glass:
   01 Doors shall be 1/4" clear tempered glass or 1/4" clear laminated safety glass.
   02 Glass shelves shall be 1/4" clear tempered glass.

E. Tackable Back Panel: Claridge Fabricork
   01 Vinyl covered 1/4" minimum cork surfacing.
   02 Color as selected by the Architect from manufacturer’s full range of color / pattern selections.

F. Housing and Trim:
   01 4” extruded aluminum perimeter trim.
   02 Continuous frame with mitered corner.
   03 Provide 4” aluminum valance behind door assembly at cases designated with interior lighting.

G. Sliding Door Assembly:
   01 Glass doors shall be fully enclosed in an extruded aluminum track frame.
   02 Top and bottom tracks with ball bearing rollers.
   03 Provide door pattern as indicated on the Drawings.
   04 Provide plunger type, keyed locks at doors.
   05 Master key all display cases to the same key.

H. Accessories:
   01 Provide continuous shelf standards at 24” O.C. maximum; flush fit.
   02 Provide corresponding shelf brackets; provide (4) brackets per standard.
   03 At cases designated with interior lighting, provide LED tube type fixtures, spaced to provide even light across the width of the case.

PART 3 - EXECUTION

3.1 PREPARATION

A. Thoroughly examine rough opening at display cases to determine they are complete and correct for proper installation of display case.

B. Notify Contractor of any discrepancies and do not proceed until all discrepancies are fully resolved.

C. At lighted display cases, coordinate with Electrician for proper rough-in and final connection of lighting.

3.2 INSTALLATION

A. Install display cases plumb and level in strict accordance with manufacturer’s installation instructions and recommendations.

B. Install door assemblies in track system and fully test for proper installation; adjust as needed for smooth operation.

C. Upon completion of installation, thoroughly clean all surfaces.

END OF SECTION

SECTION 10 14 00

SIGNAGE

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Room identification signs.
   02 Dedication plaques.
   03 Exterior wall mounted aluminum letters.

C. Related Work:
   01 Section 01 21 00 – Allowances
   02 Section 04 20 00 – Unit Masonry
   03 Section 09 21 16 – Gypsum Board Assemblies
   04 Section 09 72 13 – Digital Vinyl Wallcoverings
   05 Section 09 91 00 – Painting and Re-Painting

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Sample / Mock-Up:
01 Provide a full size, completed sample of an interior room graphic sign.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
01 ASTM B209 – Specification for Aluminum and Aluminum Alloy Sheet and Plate.
02 ASTM E284 – Standard Definition of Terms Relating to Appearance of Materials.
03 ASTM E308 – Computing the Colors of Objects by Using the CIE System.
04 ASTM E1164 – Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.

1.4 QUALITY ASSURANCE

A. Work of this Section shall comply with applicable requirements of the Handicapped Accessibility Act of Texas, as codified in Section 7, Article 601b, Vernon’s Texas Civil Statutes.

1.5 ALLOWANCE

A. Include in the proposal the cash allowance stated in Section 01 21 00 – Allowances for painted Super graphics as selected, and as directed by the Architect.

PART 2 – PRODUCTS

2.1 INTERIOR ROOM GRAPHICS AND SIGNAGE

A. Design of interior room graphics and signage is based on products manufactured by South Texas Graphics.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
01 Architectural Graphics Products (APG)
02 Corpus Christy Stamp Works
03 Genesis Graphics and Signs

C. Materials and Fabrication:
01 Core Material: 1/4" acrylic.
02 Face: Horizontal grade plastic laminate.
03 Design: as indicated on the Drawings.
04 Dimensional characters shall be precision-cut from acrylic and chemically welded to the acrylic core through precision cut-outs in laminate face.
05 Characters shall be raised a minimum of 1/32” above the laminate face.
06 Where shown on the design, fabricate to allow for replaceable sliding identification graphic inserted from either side of the sign. Provide a rigid, clear plastic acrylic cover at slot.
07 All signs shall be furnished with raised Grade II Braille perma-dots in accordance with ADA standards and requirements.

D. Mounting:
01 Install interior signage with perimeter of foam tapes and center fill of clear silicone adhesive.

02 Locate on wall adjacent to strike side of door at consistent height and distance to door frame throughout the building.
03 Where sign is mounted on a glass surface, provide a solid back-up plate of same color to cover on the reverse side on glass.

2.2 DEDICATION PLAQUES

A. Design of interior room graphics and signage is based on products manufactured by A.R.K. Ramos Architectural Signs.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
01 Essential Architectural Signs
02 Ornamental Arts Company

C. Materials and Fabrication:
01 3/4” thick cast aluminum with a brushed aluminum finish and stipple textured dark oxidized background.
02 Plaque dimensions, font style and sizes, and edging as indicated on Drawings.
03 Raised letters in satin finish as shown on the Drawings.
04 The grade 2 Braille shall be an integral part of the casting.

2.3 CAST ALUMINUM LETTERS / GRAPHICS

A. Design of cast aluminum letters is based on products manufactured by Woodland Manufacturing.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
01 A.R.K. Ramos
02 Gemini
03 Southwell Company

C. Cast aluminum letters / graphics shall be used for the school name mounted on an exterior wall of the building; and street address numbers to be mounted on the marquee site sign.

D. School Name / Signage:
01 Material: Aluminum 319 Alloy.
02 Edge: Square.
03 Case: all capitals.
04 Finish: Powder coat paint in color as selected by the Architect from manufacturer’s full range of color selections.
05 School Name: 12” tall letters.
06 Allow up to 18 characters for school name (to be determined) followed by “ELEMENTARY SCHOOL”.
07 Mounting: pin mounted with aluminum or stainless-steel studs for mounting to masonry veneer.

E. Address Signage / Numbers:
01 Material: Aluminum 319 Alloy.
02 Edge: Square.
03 Finish: Powder coat paint in color as selected by the Architect from manufacturer’s full range of color selections.
04 Address: 6” tall letters.

05 Allow up to 6 digits / characters.
06 Mounting: pin mounted with aluminum or stainless-steel studs for mounting to cast stone.
07 Provide address numbers on both sides of marquee sign. Refer to Civil Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION - INTERIOR ROOM GRAPHICS / SIGNAGE

A. All room graphics shall be firmly affixed to substrate without use of mechanical fasteners.

B. Mount graphics at a uniform height and distance from adjacent door jamb in accordance with ADA and Texas Accessibility Standards.

C. Where graphics are mounted on glass, provide a corresponding plastic laminate surfaces graphic blank on the inside of the glass.

3.2 INSTALLATION – CAST ALUMINUM LETTERS / GRAPHICS

A. Install in strict accordance with manufacturer's installation instructions and recommendations specific to this installation.

B. Coordinate with Architect for specific location and height of school name mounted on exterior masonry veneer.

C. Carefully lay out location of mounting studs on masonry veneer on building and cast stone substrate at marquee using template provide by manufacturer.
01 Drill holes to accept mounting studs per manufacturer's specifications.

D. Install cast aluminum letters and numbers, firmly fixing mounting studs in place.

END OF SECTION

SECTION 10 14 53

TRAFFIC SIGNAGE

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all exterior traffic signage as indicated on the Drawings.
   02 Provide signage at all handicap parking spaces in accordance with ADA and TAS standards, and as indicated on the Drawings.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 05 12 00 – Structural Steel Framing
   03 Section 05 50 00 – Metal Fabrications

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Show signage layout site plan.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide full color images of each sign proposed to be furnished.
   02 For each image, clearly indicate size and thickness of each sign.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   01 ASTM A500 – Cold formed welded and seamless carbon sheet structural tubing in rounds and shapes.
   02 ASTM B209 – Specification for Aluminum and Aluminum Alloy Sheet and Plate
   03 ASTM D523 – Standard Method for Test for Specular Gloss
   04 ASTM D4956 – Standard Specification for Retroreflective Sheeting for Traffic Control
   05 ASTM E284 – Standard Definition of Terms Relating to Appearance of Materials
   06 ASTM E308 – Computing the Colors of Objects by Using the CIE System
   07 ASTM E810 – Standard Test Method for Coefficient of Retro-reflection of Retroreflective Sheeting
   08 ASTM E1164 – Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation

B. Regulatory Agencies:
   01 Local Authority Having Jurisdiction. Verify requirements and comply with AHJ requirements.
   02 Manual on Uniform Traffic Control Devises (MUTCD)
   03 Standard Highway Sign Design (SHSD)
   04 Texas and Texas Manual of Uniform Traffic Control devices (TMUTCD).
   05 Americans with Disabilities Act (ADA)
   06 Texas Accessibility Standards (TAS)

PART 2 - PRODUCTS

2.1 TRAFFIC SIGNAGE

A. Substrate (Sign Blanks).
   01 This shall be minimum 0.080” for signs up to 12” x 18” and 0.125” for larger signs.
   02 Aluminum alloy 5052-H38 and otherwise in conformance with ASTM B209 and have gold chromate finish.
   03 The type of signs shall be as indicated on the standard detail sheet in the plans.
   04 Size. The dimensions of substrate applications for regulatory, warning, and guide signs shall be in accordance with the Standard Highway Sign Designs (SHSD) for Texas and with the Texas Manual of Uniform Traffic Control Devices (TMUTCD) for residential areas.
   05 Metal working. The aluminum shall be free of burrs and pits on both sides, including edges and holes, and shall be made ready for applications of the sheeting.
   06 Surface Preparation. The aluminum shall be thoroughly cleaned and degreased with solvent and alkaline emulsions cleaner by immersion, spray, or vapor degreasing and dried prior to application of the gold chromate sheeting coat.
   07 The aluminum shall be new and corrosion-free with holes drilled or punched, corners rounded to the radii shown in the standard detail sheet, and all edges smoothed prior to application of sheeting.
   08 The heavy or medium chromate coating shall conform in color and corrosion resistance to that imparted by the Alodine 1200F treatment.

B. Sign Face (Background, Legends, Symbols, and Colors). These shall be in accordance with the Standard Highway Sign Designs (SHSD) for Texas and with the Texas Manual of Uniform Traffic Control Devices (TMUTCD).
   01 The sign face, made of electronic film and retro-reflective sheeting shall comply with appearance, specification, and good workmanship designated by the using

agency for sign faces constructed of screen processed retro-reflective sheeting of the same type.

02 All sign blanks shall be covered with appropriate retro-reflective sheeting.

03 All ground mounted stop signs, warning signs, and other regulatory signs, shall use at a minimum High Intensity Prismatic Reflective Sheeting.

04 Provide verbiage, directional arrows and similar information on signs as indicated on the Drawings.

C. Signposts. Steel post shall conform to the standard specification for hot rolled carbon sheet steel, structural quality, ASTM designation A570, Grade 50.

01 Average minimum yield strength after cold forming is 60,000 psi.

02 All signposts shall be either nominal 2” diameter or 2” x 2” square pipe; provide larger posts at locations as indicated on the Drawings.

03 Provide caps at all posts.

04 All signposts shall be hot-dipped galvanized.

05 Signposts shall be painted where indicated on the Drawings.

06 Provide in length required for industry standard mounting height plus a minimum of 24” to be embedded in a minimum 12” diameter x 24” concrete footing.

D. Accessibility Signage

01 Accessibility signage shall be installed at each handicap designated parking space.

02 For sign installed in non-traffic locations (i.e. on an adjacent sidewalk or in a grade area) posts shall be nominal 2” diameter or 2” x 2” square pipe with cap, embedded a minimum 24” below grade.

03 ADA Handicap Parking signs located within parking lots shall be mounted on 2” x 12” x 1/4" structural rectangular tubes with welded 1/4" cap plate, embedded a minimum 24” below grade. Finish shall be painted as directed by the Architect.

04 All posts shall be hot-dipped galvanized after fabrication. Informational signage shall be standard sizes, shapes, colors and text as required by the ADA or TAS standards.

E. Solar Powered Flashing Beacon:

01 Design is based on Tapco Dual Vertical BlinkerBeacon system; or equal as approved by the Architect.

02 MUTCD compliant

03 System shall be DC powered, solar panel charged system.

04 Battery lifespan: 3 to 5 years, field replaceable.

05 Two 8” LED amber flashing lights in yellow polycarbonate housing.

06 Pole mounted controller in NEMA 3R aluminum housing.

07 Controller: Local 365-day programming.

08 Pole: 3” galvanized steel with base plate and base plate housing.

09 Assembly rated for a minimum 90 MPH wind speed.

10 System shall be complete, including all accessories required for a complete installation. Combine with signage as indicated on the Drawings.

11 Warranty:

a. Battery Warranty: 3 years.

b. Controller: 5 years.

c. Solar Panel: 10 years.

F. Accessories:

01 Provide standard mounting brackets and hardware to affix sign to posts.

02 All hardware shall be stainless steel.

03 All hardware shall have vandal-proof heads.

PART 3 - EXECUTION

3.1 INSTALLATION – TRAFFIC SIGNAGE

A. Install in strict accordance with manufacturer's installation instructions and recommendations specific to this installation.

B. Coordinate with Architect for specific locations.

C. All traffic signage shall be mounted at standard MUTCD regulatory heights.

D. All signs installed within a public R.O.W. shall be installed in strict accordance with the authority having jurisdiction (AHJ).
   01 Verify all conditions and requirements.
   02 Obtain all approvals and / or permits required by the AHJ.

E. Unless shown otherwise, set all sign posts a minimum 24" below grade in a minimum 12" diameter x 30" deep concrete footing.
   01 At grade areas, the top of the footing shall be +/- 2" below finish grade to allow installation of topsoil and / or sodding.

END OF SECTION

SECTION 10 14 63

DIGITAL MARQUEE SIGNS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide exterior digital display marquee sign, with integral back-lit fixed panel with luminescent graphics as indicated on the Drawings.
   02 Digital display marquee sign shall interface with Owner's data network for remote access and control.

C. Related Work:
   01 Section 03 30 00 – Cast-in-Place Concrete
   02 Section 04 20 00 – Unit Masonry
   03 Section 05 12 00 – Structural Steel Framing
   04 Division 26 – Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop drawings shall be sealed and signed by a Texas registered engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals:
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:
   01 ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

B. Standard for Electric Signs, UL listed.

C. Standard for Control Centers for Changing Message Type Signs.

D. Federal Communications Commission Regulation Part 15.

E. National Electric Code.

1.4 MANUFACTURER QUALIFICATIONS

A. LED Display Manufacturer shall:
   01 Have been in the business of manufacturing permanently mounted outdoor displays for a minimum period of five (5) years prior to the contract bid date. An “LED” display contains pixels constructed solely of high-intensity discrete LEDs. These outdoor displays must utilize a sign cabinet meeting NEMA 3R design requirements.
   02 Have in operation a minimum of one hundred (100) large outdoor permanently mounted LED displays as defined above. Each of these LED displays shall have operated successfully for a minimum period of one (1) year prior to the contract bid date.
   03 Have in operation, as of the contract bid date, a minimum of five (5) outdoor LED display systems. These LED display systems shall be communicating over direct wire dial-up telephone, cellular telephone, spread spectrum radio, or fiber optic backbones. Each of the five systems shall contain a minimum of two (2) permanently mounted displays. All systems shall be owned and operated by five different agencies.
   04 Have been in business under the same corporate name for a period of no less than five (5) years prior to the contract bid date.
   05 Utilize a documented in-house quality management procedure that has been in place for no less than two (2) years prior to the contract bid date.
   06 Provide a toll-free help desk number that will be manned during normal business hours.

B. Documentation that proves the LED display manufacturer complies with these requirements shall be provided with the LED display manufacturer's pre-build technical submittal. This submittal shall also include references and project information for all five (5) of the systems referenced above, including:
   01 Equipment owner/operator agency name.
   02 Contact person name, telephone number, fax number, and e-mail address.
   03 Display system name and location of operations control center (project name/number).
   04 Display quantity.
   05 Display commissioning date (First date of successful on-site operation).
   06 LED display size (pixel rows by pixel columns) and type (full LED display, line LED display, or discrete character.
   07 Display housing access.
   08 Type of communications backbone used (telephone, fiber optic, direct, etc.).

C. Experience with manufacturing the following types of electronic sign products shall not satisfy the requirements of this LED Display Specification:
   01 Indoor displays of any size or type.
   02 Back-lit displays.
   03 Split-flap displays.
   04 Any type of display that is not pixilated and cannot be programmed to show a nearly infinite quantity of messages.
   05 Displays that have a pixel technology comprised of something other than high-intensity light emitting diodes (LED). Examples of unacceptable technologies are incandescent lamp, liquid crystal, fiber optic, flip disk, flip-fiber combination, and flip-LED combination.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain electronics displays and equipment through one source from a single manufacturer.

B. Message center shall be designed for interior or exterior installation with weatherproof housing.

C. Message center and other electrical components shall be certified for use in United States and Canada by Underwriters Laboratories (UL) and shall bear UL label.

D. Message center and other electrical components shall be electrically grounded in accordance with National Electrical Code (NEC), Article 600.

E. If incorporated, wireless control unit shall comply with Part 15 of FCC Rules.

1.6 WARRANTY / SERVICE PLAN

A. Provide a five (5) year parts and labor coverage of message center to cover defects in material and / or workmanship.
   01 Warranty shall include all electronic components, mechanical components, fabricated components and finishes, and control software.

B. A help desk staffed by experienced technicians and coordinators thoroughly familiar with the display and operating software shall be available for technical support.
   01 The help desk and staff shall be provided within the base proposal amount and shall be at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of digital marquee sign is based on products manufactured by Daktronics.

B. The following manufacturers are acceptable provide all proposed products meet or exceed the specified requirements:
   01 Atlas Sign Services, Inc.
   02 Approved Equal

2.2 GENERAL

A. The digital marquee sign shall be comprised of a fixed, backlit section above a digital LED section, all housed in a single cabinet.
   01 Marquee sign shall be double sided; each side identical.

B. Nominal dimensions of the overall sign shall be 66” high x 120” wide. Depth shall be symmetrical about support columns and be the minimum required for servicing lamps and proper operation of the sign.
   01 Fixed Backlit Section: nominal 30” high x 120” wide.
   02 Digital LED Section: nominal 36” high x 120” wide.

C. The complete unit shall be provided by a single manufacturer.

D. The sign shall be complete, including all components, software and other materials required. Refer to the Drawings for proposed mounting and interface with adjacent work and coordinate with other trades as required for proper interface and mounting requirements.

E. Coordinate with Electrical Contractor for installation and proper interface with all electrical components and requirements.

2.3 BACK-LIT SIGN - GENERAL

A. Custom Fabricated Internally Lighted Marquee Sign:
   01 Provide a custom fabricated, double faced cabinet with anodized aluminum .090” thick walls. Cabinet shall be integral with the digital display section cabinet.
   02 Face Panels: High impact resistant, white translucent “Lexan”. Minimum panel thickness shall be 0.375”.
   03 Lexan faces shall be screened with either translucent vinyl or translucent silkscreen image; in colors as selected by the Architect.
   04 Provide internal uniform lighting with 120-volt, 4-foot fluorescent light fixtures in quantities as recommended by the manufacturer for most effective visibility and impact. Fixtures shall be UL labeled.
   05 Refer to Electrical Drawings and coordinate with electrical subcontractor as required for proper interface and installation.

B. Mounting:
   01 Provide all mounting hardware and fasteners required to firmly anchor marquee sign to the supports indicated on the Drawings.
   02 All mounting hardware shall be stainless steel.

C. Graphics: Sign design shall include a custom school sign, including school name, school district name, school mascot graphic and / or district logo.
   01 Architect shall provide camera ready graphics for use by sign company.

2.4 CABINET CONSTRUCTION

A. General Specifications:
- 01 Coordinate with structural steel fabricator / erector for all requirements of structural steel and steel brackets required for installation and attachment of Marquee Sign.
- 02 The overall front-to-back housing depth shall be the minimum required to service the fixed panel section of the sign and shall be symmetrical about the axis of the supporting masonry columns.
- 03 Maximum display power shall not exceed 580 watts when 100% of the pixels are operating at their maximum possible drive current.
- 04 Display shall operate from one of the following power sources: 120 VAC, 50/60 Hz single-phase, including neutral and earth ground.
- 05 The display housing shall meet NEMA 3R standards.
- 06 Display shall operate in a minimum ambient temperature range of -40 to +120 °F and to 100% humidity.
- 07 No heating element shall be required to insure operation of LED display.
- 08 Internal display component hardware (nuts, bolts, screws, standoffs, rivets, fasteners, etc.) shall be fabricated from stainless steel, aluminum, nylon, or other durable corrosion-resistant materials suitable for the signage application.
- 09 Electrical display components shall be 100% solid-state.
- 10 The presence of ambient radio signals and magnetic or electromagnetic interference, including those from power lines, transformers, and motors, shall not impair performance of the display system. The display system shall not radiate electromagnetic signals that adversely affect any other electronic device.
- 11 The display shall contain a full LED matrix measuring a minimum of 24-pixel rows high by 96-pixel columns wide. The LED display shall display messages that are continuous, uniform, and unbroken in appearance.

B. Housing Frame:
- 01 The frame shall be of unibody construction with back-sheets and vertical supports to provide cabinet rigidity.
- 02 The basic frame shall be made from 0.09" thick aluminum with the back-sheet being made from 0.05" thick aluminum.
- 03 To meet the anti-corrosive, degradation, and oxidation requirements, the display housing aluminum sheet quality shall be no less than the properties of alloy 5052-H32.
- 04 Adequate ventilation shall be provided, either through convection or with fans on the front and back of the display. Display does not require perimeter spacing for airflow.
- 05 Steel clip angles shall be provided with the display.
- 06 Shall include lifting supports that can be removed after installation.

C. Exterior Finish:
- 01 The LED display cabinet and front face border pieces shall be coated with automotive-grade acrylic urethane paint.
- 02 Color as selected by the Architect from manufacturer’s full range of colors.

D. Front Face Construction:
- 01 To meet the display readability requirements, the front face must be constructed in such a manner that it provides high contrast, low sunlight reflection and durability in all weather and site conditions.
- 02 Surface materials in the LED active area such as metal, plastic, or other face materials shall be designed for low sunlight reflectivity.
- 03 Minimum features of front face shall:
- 04 Provide UV resistance to prevent discoloring.
- 05 Include louvers for contrast enhancement.

06 Use surface materials in the active LED area, such as metal, plastic, or other face materials, designed for low sunlight reflectivity.
07 Provide water shedding ability (designed to meet NEMA 3R Standards)
08 Withstand all general weather conditions.

E. Serviceability:
01 The display shall be equipped with lifting supports, which can be removed after installation.
02 The display housing shall provide safe and convenient front service access for all modular assemblies, components, wiring, and other materials located within the housing.
03 All internal components shall be removable and replaceable by a single technician with basic hand tools.
04 Service access shall be easily obtained by opening up the hinged front panel.
05 Displays shall be designed with service features that minimize potential bodily harm.

2.5 DISPLAY COMPONENTS

A. LED display modules shall be constructed for good readability, long life, and ease of service. Each display module shall be constructed as follows:
01 An LED module shall consist of LEDs with all drive electronics mounted on a single Printed Circuit Board (PCB).
02 LEDs shall be auto-inserted in order to maintain quality and uniformity of the LEDs within each LED module.
03 All PCBs shall be wave-soldered to ensure uniformity, quality, and durability of all solder joints.
04 All PCBs shall be cleaned in a manner so as not to contain more than 2 parts per million contaminants.
05 All PCBs shall be conformal coated to protect electronics against corrosion.
06 Module signal and electrical connections shall be of the positive locking and removable type. Removal of a module from the display shall not require a de-soldering operation.
07 All LED display modules in a single display shall be identical in construction and interchangeable throughout the display.
08 Module LED uniformity shall be consistent to the point that modules can be interchanged between displays without a noticeable difference in appearance.
09 All module rows shall include louvers for sunlight shading and enhanced contrast.
10 Modules shall be individually attached to the hinged front panel.
11 Removal of one or more modules shall not affect the display's structural integrity.
12 The distance from the center of one pixel to the center of all adjacent pixels shall be 34 mm (1.33 inches) both horizontally and vertically.
13 The failure of a single pixel shall not cause the failure of any other pixel in the display.
14 All modules shall have a minimum of 30° vertical and 70° horizontal half-intensity viewing angles.
15 The transition of the viewing intensity shall be consistent throughout the viewing cone.

B. Pixels shall be constructed with discrete LEDs, and these discrete LEDs shall conform to the following specifications:
01 LEDs shall be non-diffused, ultra-bright, solid-state light emitting diodes constructed of AlInGaP technology.
02 The LED lens diameter shall be 0.2 inches (5 mm). This is sometimes referred to as a T 1-3/4 style LED package.
03 LEDs shall emit either red or amber light that has a peak wavelength of 628 +/- 4 nm and 590 +/- 4nm respectively.

04 LEDs used in all LED displays provided for this contract shall be from the same manufacturer and of the same part number to insure uniformity.
05 LED half-life shall be an estimated minimum of 100,000 hours.
06 Display shall have a minimum intensity of 4,500 cd/m2for red and 7,000 cd/m2 amber.

C. Regulated switching DC Power Supplies shall power the LED modules and protect the LED pixel, LED display, and driver circuitry in the event of power spikes or surges. Regulated DC power supplies shall conform to the following Specifications:
01 Maximum output power rating of 100 Watts.
02 Operating input voltage range: +85 to +264 VAC.
03 Power supply efficiency: 74% minimum.
04 Power factor rating: 0.95 typical.
05 Over current protection: 105%.
06 Over voltage protection: 115 – 140%.
07 UL listed.

D. Internal Wiring:
01 Wiring for LED display modules and other internal components shall be installed in the housing in a neat and professional manner.
02 Wiring shall not impede the removal of display modules, power supplies or other display components.
03 Wires shall not make contact with or be bent around sharp metal edges.
04 Module power and signal wiring shall be cut to a length, labeled and installed such that it is not possible to connect a module to the wrong set of wires.
05 All wiring shall conform to the National Electric Code.

E. The display shall be protected from electrical spikes and transients.

F. The manufacturer shall provide an earth ground lug in the display.

2.6 DISPLAY PERFORMANCE

A. Display Capability:
01 The display shall contain a full LED matrix measuring a minimum of 24-pixel rows high by 96-pixel columns wide.
02 The LED display shall present messages that are continuous, uniform, and unbroken in appearance.
03 Each display pixel shall be comprised of monochrome LEDs. Other pixel technologies, such as fiber optic, flip disk, combination flip disk fiber optic, combination flip disk LED, liquid crystal, and incandescent lamp will not be accepted.
04 The centers of all adjacent pixels shall be spaced 34 mm (1.33 inches) apart, both vertically and horizontally.
05 The pixel LED display shall be capable of displaying alphanumeric character fonts ranging in height from 9” to 32”.
06 The display shall be able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images.
07 Displays shall be legible under the following conditions:
a. 24 hours per day and in most normally encountered weather conditions.
b. During dawn and dusk hours when sunlight is shining directly on the display face or when the sun is directly behind (silhouetting) the display.

B. Controller:
01 The controller shall be able to run independently from the controlling computer allowing the display to operate even when the computer is unhooked or turned off.
02 All signal inputs shall be optically isolated (with the exception of RS-232).

03 Communication protocol shall support other products from the vendor such as other outdoor or indoor displays of varying sizes and/or colors.
04 The controller shall be able to operate via RF radio, serial (RS-232, RS-422, fiber optic), modem, or Ethernet (copper or fiber) communication.
05 Each controller shall be connected to a light sensor allowing each LED display to automatically adjust to a minimum of 64 levels of brightness according to display direction and lighting conditions.
06 The controller shall allow connection to a temperature sensor that provides accurate site temperatures.
07 Controller will have a time of day clock/calendar that supports auto-adjust for Daylight Savings Time.
08 Active messages, stored messages, message schedules, display configuration, time and date shall be stored in non-volatile memory. No external power or battery backup will be required to maintain this data.
09 Controller shall have 14MB of memory.
10 Controller can be configured with a unique name for the display.
11 When powered on, the display will present the following information at a minimum on the display face:

a.	Product name	i.	IP address
b.	Size of pixel matrix	j.	Subnet Mask
c.	Color shading	k.	COM1 configuration
d.	Bootloader version	l.	COM2 configuration
e.	Firmware number	m.	Socket 3001
f.	Firmware revision	n.	Socket 3002
g.	Hardware address	o.	Line frequency
h.	Software address	p.	Panel description

C. Control and Communications:
01 Each single-face display shall be controlled and monitored by its own LED controller.
02 A single LED controller shall control double-face displays.
03 The LED controller shall be a stand-alone processor, which does not require continuous communication with control software in order to perform all functions.
04 The LED controller shall be able to receive instructions from and provide information to a computer containing control software using the following communication modes:
a. RS232/ RS422 – Via direct RS232 connection or using an RS232 signal converter. The RS422 signal converter shall provide signal optical isolation between the display and the control computer and/or network.
b. Dial-up Modem – Via dial-up communication using an internal Hayes-compatible modem.
c. Fiber Optic Cable – Via fiber optic cable to an internal RS232 signal converter.
d. Ethernet -- Via 10base-T, 100base-T Ethernet connection or fiber optic 10base-FL. Controller shall auto-negotiate between 10-100base T.
e. Ethernet Bridge Radio -- Via 10base-T Wireless Ethernet Bridge connection or fiber optic 10base-FL. Controller shall auto-negotiate between 10-100base T for copper-based Ethernet systems.
f. Serial Radio – Via RF communication transmitting at 2.4 GHz with a baud rate of 19.2 kbaud capable of broadcasting to multiple client radios.

2.7 CONTROL SOFTWARE

A. General Software Features:
01 The control software for the displays shall be Windows® based (including Windows 98, 2000, XP, etc.).

02 Software shall configure displays with the use of a Display Creation Wizard in the Venus 1500 Administrator.
03 Software shall provide features for creating, editing, scheduling, running, and deleting messages.
04 Software shall include profanity protection.
05 Software shall include password protection on controlled displays for a more secure environment.
06 Software shall manage messages and schedules on displays and execute scripts to run messages and blank displays.
07 Software shall have the ability to create dynamic data fields in messages to display dynamic content (time, date, temperature, and RTD).

B. Messaging:
01 Software shall have the ability to create and edit message content with ease in a graphical representation of the display.
02 Software shall have the ability to preview messages before being displayed.
03 The display shall have the ability to store a minimum of 12 MB of messages.
04 Hold times for each frame must be variable in 0.1 second increments with a minimum of 0.1 seconds and a maximum of 24 hours.
05 Each message shall be stored in a single file.
06 Messages shall run in a looping queue.
07 The software shall have the ability to schedule up to 100 messages.
08 Software shall use visual effects in your messages for entry, hold, and exit frame transitions.
09 The software frame viewer shall allow simplified management of all the frames in a message to increase editing productivity.
10 Software shall have the ability to schedule messages to run and stop by defining a starting time/date and an ending time/date.
11 A single frame shall encompass the entire face of the display.
12 The contents of a text window shall be capable of being left, center or right justified horizontally.
13 Text shall have several possible display modes, including outline, drop shadow, bold, italic, and underline.
14 Software shall have the ability to copy and paste text from most Windows applications.
15 Messages may be retrieved from the display for editing.
16 Messages shall consist of a series of frames with each frame containing a set of windows.
17 Each frame may have an image in the background with the ability to overlay text in windows.
18 Windows may be placed free form at any location within the frame.
19 Windows may be overlapped.
20 Text windows have a transparent background.

C. Display of Alphanumeric Text:
01 For message creation, the display shall be supplied with a minimum of five (5) ASCII English alphanumeric character font sets.
02 Each font shall include the following characters at a minimum:
a. The letters “A” through “Z” in both upper and lower case.
b. Decimal digits “0” through “9”.
c. A blank or space character.
d. Punctuation marks: . , ! ? - ‘ ’ “ ”
e. Other characters, such as: # & * + / ( ) [ ] < >
03 Additionally, each text font will include the following in the extended ASCII range:
a. Eight (8) directional arrows: ↓, ←, ↖, ↑, ↗, →, ↘, ↓, and ↙
b. A minimum of 25 characters used for the display of non-English Latin-based text (i.e., Ç and é).

04 Font files shall include data that provides inter-character spacing.

05 The following character font files shall be supplied with the display for this contract:

a. “Normal 7” or “7x4 Single Stroke” – Characters average seven (7) pixel rows high by four (4) pixel columns wide, have a single-pixel stroke width and provide one-pixel column of inter-character spacing.

b. “Wide 7” or “7x6 Double Stroke” –Characters average seven (7) pixel rows high by six (6) pixel columns wide, have a two-pixel stroke width and provide one-pixel column of inter-character spacing.

c. “Fixed Width 7”– All characters are seven (7) pixel rows high by five (5) pixel columns wide, have a single-pixel stroke width, and provide one-pixel column of inter-character spacing.

d. “Graphic 7” – Displays graphical characters. A typical font is seven (7) pixel rows high with varying width and provides no inter-character spacing.

e. “Normal 16”– Characters average sixteen (16) pixel rows high by eight (8) pixel columns wide, have a two-pixel stroke width, and provide one-pixel column of inter-character spacing.

f. “Graphic 15” – Displays graphical characters. A typical font is fifteen (15) pixel rows high with varying width and provides no inter-character spacing.

g. “Fixed Width 15” – All characters are fifteen (15) pixel rows high by nine (9) pixel columns wide, have a two-pixel stroke width, and provide one-pixel column of inter-character spacing.

06 If the display is greater than 16-pixel rows high, the following fonts will be substituted for the “Normal 16” included above.

a. “Normal 15” or “15x6 Double Stroke” – Characters average fifteen (15) pixel rows high by nine (9) pixel columns wide, have a two-pixel stroke width and provide one-pixel column of inter-character spacing. Replaces “Normal 16 font listed above”.

b. “Normal 23” or “23x11 Double Stroke” – Characters average twenty-three (23) pixel rows high by eleven (11) pixel columns wide, have a three-pixel stroke width and provide two-pixel columns of inter-character spacing.

D. Time, Date, Temperature, and RTD Fields:

01 The software shall have the ability to display time and date in common standard and military formats within a message.

02 The software shall be able to program the controller to automatically adjust time zone offsets.

03 The software shall have the ability to accurately display local temperature from an installed temperature sensor in both Fahrenheit and Celsius.

04 A feature will be included to calibrate the temperature sensor up or down in the range +/- 9°F (+/- 12° C).

E. Display of Graphic Images:

01 The display and control software provided for this Contract shall have the capability of using “graphic frames”.

02 The display shall be able to show messages containing graphic images of any size that will fit on the LED matrix.

F. Presentation Modes:

01 Entry Modes:

a. Change / Instant
b. Roll (right, left, up, down)
c. Scroll (rt to lt & lt to rt)
d. Travel
e. Flash
f. Scroll
g. Wand
h. Unveil
i. Zoom
j. Splice
k. Slot machine
l. Radar
m. Kaleidoscope
n. Page Turn
o. Coalesce

02 Hold Effects:
- a. Twinkle
- b. Flash
- c. Steady
- d. Bijou
- e. Rumble

03 Exit Effects:
- a. Stay
- b. Dissolve
- c. Venetian
- d. Roll
- e. Scroll
- f. Wand
- g. Unveil
- h. Zoom
- i. Page Turn
- j. Splice
- k. Slot Machine
- l. Radar
- m. Kaleidoscope
- n. Blank

G. Display Communication and Protocol: All communications between the display control software and display(s) shall be accomplished using a protocol meeting the following Specifications:

01 Communications shall include multi-layer protocol consisting of data-link and application layers at a minimum.

02 The data-link protocol will use a check summing technique to guarantee packet integrity. Packets must be discarded if the packet's check sum is not valid.

03 Each display on the network will be assigned a unique physical address in the range 1 to 240.

04 Each display must respond to every packet addressed to it, except in the case of broadcast addressing. Displays must never initiate communication on the network. Each response will indicate the success or failure of the display to act upon the received packet.

05 A software address may be assigned to each display. The address will override the physical address.

06 Broadcast addressing will allow multiple displays to receive a single packet.

H. Diagnostics and Status Information: The software shall be capable of displaying operational status of each display. This shall minimally include the following information:

01 Display Name: Name of the display as entered by the operator.

02 Address: An identification number associated with a specific sign by which the software locates the sign to establish communications.

03 Communications Status – Pictorially represented as "Normal" or "Failed".

04 Current Message – As {name of message being displayed} or "Blank".

05 Time and Date – As running on the display.

06 Last Reset – Date and time of last communications with sign.

07 Available Memory – Pictorially and numerically represented memory available in the LED controller.

08 Brightness – The intensity control of the LEDs at which the display is currently operating, set as "Automatic" or "Manual".

09 Firmware Version – Current firmware version of the LED controller.

10 Schedule Status – Indicates if a schedule is active at the display.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field verify all interfacing and adjacent work is installed in accordance with the requirements for the proper installation of the Marquee Sign. Coordinate with Contractor(s) as required prior to the installation of their work.
   01 Structural steel supports and brackets.
   02 Masonry columns.
   03 Electrical Verify that separate conduit is in place for power and data to display, unless fiber is being used.
      a. Verify that all control equipment has access to 120 VAC.
      b. Possible power and signal entrances are designated by center punches. Separate conduit must be used to route the power, signal in wires, and signal out wires.
      c. Displays must be grounded according to the provisions outlined in Article 250 of the National Electrical Code. The display must be connected to earth-ground. Proper grounding is necessary for reliable equipment operation and protects the equipment from damaging electrical disturbances and lightning.

3.2 INSTALLATION

A. Sign and accessories shall be installed in strict accordance with printed manufacturer's instructions and recommendations.

B. Sign installer shall provide any licenses or permits required from authorities having jurisdiction for the installation of the Marquee Sign.

C. Provide all accessories for a complete installation.

D. Sign manufacturer / installer shall make all final electrical connections to the Marquee Sign.

3.3 TESTING AND TRAINING

A. Fully test the Marquee Sign through all messaging capabilities.

B. Provide training to Owner designated personnel for the proper maintenance, operation and programming requirements of the Marquee Sign.

C. Provide comprehensive training to Owner.
   01 Training shall be on-site.
   02 Coordinate with Owner for schedule.

D. Provide comprehensive written instruction manuals for all material covered in the Owner training session.

END OF SECTION

SECTION 10 21 13.19

PLASTIC TOILET COMPARTMENTS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide floor mounted overhead braced, solid HDPE plastic toilet partitions in sizes and configurations as indicated on the Drawings.
   02 Provide floor anchored wall hung, solid HDPE plastic privacy screens in sizes and configurations as indicated on the Drawings.
   03 Provide solid HDPE countertops and backsplashes in sizes and configurations as indicated on the Drawings.

C. Related Work:
   01 Section 10 44 00 – Toilet, Bath and Laundry Accessories.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

D. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

E. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembly components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.
04 Provide a sample of each type of hardware associated with toilet partitions.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM International (ASTM):
01 ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
02 ASTM D1735 – Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus.
03 ASTM D2247 – Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity.

B. National Fire Protection Association (NFPA):
01 NFPA 286 – Standard Methods of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

C. Accessibility: Requirements of Americans With Disabilities Act (ADA) and Texas Accessibility Standards.

1.4 WARRANTY

A. Manufacturers Standard Warranty: For Solid Plastic HDPE Material: Against breakage, corrosion, and delamination for fifteen (15) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Partitions and Hardware: Design is based on products / systems manufactured by ASI / Accurate Partitions Corp.

B. Other Acceptable Manufacturers: The following manufacturers are acceptable provided products furnished meet or exceed all specified requirements and attributes of the design basis product / system.
01 Ampco Products
02 Bradley
03 Comtec
04 Metpar
05 Scranton Products

C. All components shall be products manufactured / provided by the manufacturer.

2.2 MATERIALS - TOILET PARTITIONS

A. Design of plastic toilet partitions is based on ASI / Accurate Partitions high density polyethylene (HDPE) solid plastic toilet partitions.

B. All toilet partitions shall be floor mounted, overhead braced, solid HDPE plastic, and in the dimensions and arrangements indicated on the Drawings.

C. Panels:
   01 Material shall be extruded high-density-polyethylene (HDPE) virgin resin materials in through colors that extend throughout the panel.
   02 Minimum Class B Fire Rated. ASTM-84-05.
   03 Conforming to requirements of NFPA 286.
   04 Doors and panels of compartments shall have a finished thickness of minimum 1 inch with 1/4" radius corners and shall have a uniform flush front appearance.
   05 Pilasters and wall posts of compartments shall have a finished thickness of minimum 1 inch with 1/4" radius corners and shall have a uniform flush front appearance.
   06 Stiles shall have a concealed leveling device to adjust to sloped floors.
   07 Panel Height: 55” panels mounted 14” above the floor; top of partitions nominally 69” above finish floor.
   08 Overhead Rail Height: minimum 82” above finish floor.

D. Compartment Doors:
   01 Standard toilet compartment doors shall be 24” wide.
   02 Accessible 60” toilet compartment doors shall be 36” wide.

E. Panel Finish: Color as selected by Architects from manufacturer’s full line of colors, textures and patterns.
   01 Partition finishes shall include smooth and textured selections.

F. Toilet compartments / partition enclosures shall meet all requirements of ADA and Texas Accessibility Standards.

2.3 MATERIALS – PRIVACY SCREEN PARTITIONS

A. Design of plastic privacy screen partitions is based on ASI / Accurate Partitions high density polyethylene (HDPE) solid plastic partitions / products.

B. All privacy screen partitions shall be pilaster mounted, wall hung, solid HDPE plastic, and in the dimensions and arrangements indicated on the Drawings.

C. Panels:
   01 Material shall be extruded high-density-polyethylene (HDPE) virgin resin materials in through colors that extend throughout the panel.
   02 Minimum Class B Fire Rated. ASTM-84-05.
   03 Conforming to requirements of NFPA 286.
   04 Panels shall have a finished thickness of minimum 1 inch with 1/4" radius corners and shall have a uniform flush front appearance.
   05 Pilasters compartments shall the same as compartment panels and shall be minimum 6” wide.
   06 Panel Height: 55” panels mounted 14” above the floor; top of partitions nominally 69” above finish floor.
   07 Overhead Rail Height: minimum 82” above finish floor.

D. Panel Finish: Color as selected by Architects from manufacturer’s full line of colors, textures and patterns.
   01 Partition finishes shall include smooth and textured selections.

E. Privacy screen partitions shall meet all requirements of ADA and Texas Accessibility Standards.

2.4 MATERIALS – PARTITION HARDWARE AND ACCESSORIES

A. All door hardware, mounting brackets and support brackets shall be manufacturer's standard products as required for issuance of specified warranty.
   01 The following hardware Specifications are based on products furnished by ASI / Accurate Partitions.
   02 Minor variations in hardware from other acceptable manufacturers are allowed, provided the proposed hardware meets or exceeds specified requirements; and meet the intent of the design and performance requirements.

B. Door Hinges: Shall be a wrap-around, cam-action type hinges.
   01 Through bolted to pilasters and panels with vandal-proof, stainless steel barrel bolts and fastened to walls with #14x 1-1/2" stainless steel security pins located behind the panel.
   02 Minimum 2 pair at each door.
   03 Stainless steel, Type 320 or 304.
   04 Nominal size: 8".
   05 Shall provide door return to pre-set position when not in locked position.

C. Door Strike and Keeper: Shall be fabricated from heavy duty aluminum extrusion (6463-T5 Alloy).
   01 Through bolted to pilaster with stainless steel barrel bolts. Side bolt and button shall be heavy duty aluminum.
   02 Shall be configured to provide for emergency access.

D. Headrails and headrail returns of overhead braced toilet compartments shall be aluminum extrusion (6463-T5 Alloy) with bright-dipped anodized or satin finish.
   01 Configuration shall be anti-grip profile.
   02 Headrails and brackets shall be 18-gauge stainless steel.

E. Wall brackets shall be full length extruded 6063-T5 aluminum brackets and shall be used for all pilasters-to wall, pilaster-to panel and panel-to-wall connections.
   01 Wall brackets shall be through bolted to pilasters and panels with vandal-proof, stainless steel barrel bolts and fastened to walls with #14x 1-1/2" stainless steel security pins located behind the panel.

F. All pilasters shall have Type 302/304, 18-gauge stainless steel pilaster shoes anchored to finish floor with minimum #14x1-1/2" stainless steel screws.

G. Provide all other accessories required for a complete installation as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's printed instructions.

B. Install all partitions where indicated on the Drawings, and as indicated on the Shop Drawings. Anchor all components firmly in place for a long life under hard use, and in complete accordance with the manufacturer's recommendations.

C. Provide blocking/anchoring devices to secure to wall. Anchoring devices must be compatible to wall type to ensure adequate strength.

D. At drywall construction, treated 2X blocking shall be installed between studs and wall brackets/accessories shall be attached to blocking using 2” coated wood screws at 12” O.C. maximum spacing.

E. Provide pliable spacers between wall and backside of wall brackets / hardware to prevent crushing of wall finish.

3.2 CLEANING AND ADJUSTING

A. Defaced finish will not be permitted. Damaged, scratched or defective materials will be rejected, and shall be replaced with new materials.

B. Clean surfaces free of oil and imperfections.

C. Except for compartments for the handicapped, adjust doors to remain at a uniformly open position when unlocked.

END OF SECTION

SECTION 10 21 23

CUBICLE CURTAINS AND TRACK

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide cubicle curtains and track assemblies as indicated on the Drawings.

C. Related Work:
   01 Section 09 51 13 – Acoustical Tile Ceilings

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show dimensioned locations of assembled components.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3", but must be large enough to convey attributes of the proposed product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Cubicle Curtains and Tracks are based on products and assemblies manufactured by CS Cubicle Curtains.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provided all proposed products meet or exceed the specified requirements.
   01 General Cubicle Co.
   02 Graber
   03 Imperial Fastener Co.
   04 A.R. Nelson Co., Inc.
   05 Watrous, Inc.

C. Curtain:
   01 Coral of Chicago
   02 General Cubicle Co.
   03 Imperial Fastener Co.
   04 Webb Manufacturing Co.

2.2 MATERIALS

A. Curtain Track - provide one at each cot location in Clinic as indicated on the Drawings:
   01 Provide CS Cubicle Curtains #6063 suspended-mounted tracks of heavy extruded aluminum alloy 6063-T4, 1 3/8" x 3/4", slotted to receive roller carriers
   02 Complete with accessories and components required for complete and secure installations including splices and end caps.
   03 Corner Bends: Provide 16” to 18” radius corner bends fabricated from a continuous track to form a 90 degree “L”.
   04 Carriers: CS Cubicle Curtains model 1062N, virgin nylon axle with nylon wheels complete with nickel plated brass bead chain and hook assembly. Provide one carrier per 6” of cubicle curtain width.
   05 Operation: Hand drawn; provide 48 inch baton for hand operation
   06 Finish clear anodized
   07 Suspension Height: Refer to Drawings for ceiling heights in room(s) to receive curtain track system.

B. Curtain:
   01 Provide manufacturer’s standard 5 oz./Class “A” polyester fabric curtains at each section of track compartmentalized cot / area.
   02 Curtain shall be 10% wider than opening with flat panel, grommets at 6 inches on center, and 20 inches of open mesh at top.
   03 The bottom of the curtain shall be 6 inches above the finish floor.
   04 Curtain color shall be as selected by the Architect from manufacturer’s standard selections.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine the acoustical ceiling grid installation and confirm it is suitable for installation of cubicle curtain track.

B. Coordinate with others as require to address any issues or discrepancies.

3.2 INSTALLATION

A. Install cubicle curtain track and curtain in strict accordance with manufacturer's instructions and final submittals.
   01 Using corner bends, splices and other accessories, track shall be continuous and suitable for smooth operation of curtain rollers.
   02 Confirm curtain track is properly installed prior to installation of curtain and rollers.
   03 Install curtain with hand pull at leading end.
   04 Install end caps to restrain curtain within track

B. Cycle curtain a minimum ten (10) times along the entire length and adjust as required for smooth, proper operation.

END OF SECTION

SECTION 10 22 26.13

OPERABLE PARTITIONS – HINGED CONTINUOUS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide continuously hinged operable partition assemblies as indicated or scheduled on the Drawings.
   02 Assemblies shall be complete with all support devices, tracks, accessories and interfacing assemblies as required to conform to the configuration(s) indicated on the Drawings.

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 50 00 – Metal Fabrications
   03 Section 08 71 00 – Door Hardware
   04 Section 09 21 16 – Gypsum Board Assemblies
   05 Section 09 51 13 – Acoustical Tile Ceilings

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Product data shall include test certificates / reports, other certifications and applicable documentation to demonstrate compliance and as required by the specification.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface with adjacent assemblies / materials depicted in the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.
   03 Where blocking is required, clearly indicate type, size and location; and coordinate with other trades as required for proper installation

D. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

E. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembly components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

F. Warranty:
   01 Provide one (1) sample of each warranty proposed to be furnished.

G. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of the actual material proposed to be furnished; paper or digital samples shall not be accepted.
   03 Minimum size shall be 6” x 6” but must be large enough to convey attributes of the proposed product.

H. Operations and Maintenance Manuals
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

I. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCE

A. ASTM International:
   01 ASTM E84 – Surface Burning Characteristics of Building Materials
   02 ASTM A653 – Specification for General Requirements for Steel Sheet, Alloy-Coated (Galvanneal) by the
   03 ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   04 ASTM E84 – Surface Burning Characteristics of Building Materials.
   05 ASTM E90 – Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions.
   06 ASTM E413 – Classification for Rating Sound Insulation.
   07 ASTM E557 – Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.

B. Federal Specifications:
   01 CCC-W-408A – Federal Specification for Vinyl Coated Wall Coverings.

C. National Fire Protection Association (NFPA)
   01 NFPA 70 – Standard for the Safe Installation of electrical Wiring and Equipment

1.4 QUALITY ASSURANCE

A. The operable wall shall be installed by a manufacturer’s authorized installer with a minimum of five (5) years’ experience in the installation of electrically operated, continuously hinged operable partitions.

B. The operable wall shall have been tested in an independent acoustical testing laboratory in accordance with ASTM E90 and ASTM E413 test procedures.

C. The operable wall panel construction and finish materials shall consist of Class A rated materials (unless otherwise noted, under “Finishes” Part 2 – Products) in accordance with ASTM E84.

D. The operable wall shall be installed by the manufacturer's authorized distributor in accordance with ASTM E557.

E. Coordinate with structural steel fabricator / erector to assure proper interface with operable wall track system and supporting structural steel.

F. Coordinate with concrete and flooring contractors to assure level flooring within tolerances required for proper installation and operation of operable wall assembly.

1.5 SEQUENCING / SCHEDULING

A. Beam Punching: Manufacturer shall provide beam punching template drawing detailing the anchor locations for the suspended track system, as required for the fabrication and installation of structural overhead support by others.

B. Track Installation: Scheduling of operable wall track installation shall occur after structural overhead support has been properly and completely fabricated and installed by others.

C. Panel Installation: Operable wall panel installation shall occur after fixed wall substrate construction is properly and completely installed by others, as required to protect panels from ongoing adjacent construction.

1.6 WARRANTY

A. Manufacturer shall warrant each operable partition and its component parts to be free from defects in material and workmanship for a period of five (5) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The design of operable partitions is based on products manufactured by Kwik-Wall Company.

B. Other Acceptable Manufacturers: The following manufacturers are acceptable provided the proposed products meet or exceed the attributes and quality of the basis of design system:
   01 Hufcor
   02 Modernfold Industries, Inc.
   03 Moderco

2.2 OPERABLE WALL MATERIALS

A. The design of continuously hinged operable partitions is based on Kwik-Wall Series 3000 Model 3050 Continuously Hinged / Electric Operable Partition.
   01 Panel faces shall be laminated to appropriate substrate to meet a minimum of STC 49 per ASTM E90.

B. Panel Construction:

01 Panel Dimensions:

a. Standard panel dimension shall be a nominal 4" thick.

b. Panel widths shall be nominal 48” maximum

02 Panel Frame:

a. Steel frame shall be 16-gauge galvanneal steel, which meets or exceeds ASTM A653 requirements.

b. Frame shall be all-welded construction with steel corner supports and cross-bracing reinforcement.

c. Top horizontal cross member shall be a minimum 7-gauge structural rectangular steel tube designed to accept a spring-loaded floating carrier.

d. Panel frame shall be Class A rated, fire retardant, non-combustible and non-corrosive in accordance with ASTM E84.

03 Panel Skins: Panel skins shall be Class A rated in accordance with ASTM E84.

04 Panel skins shall be steel skins consisting of minimum 22-gauge tension-leveled galvanneal steel, pressure laminated to a structural acoustical backer and to the steel frame to form a rigid, unitized and structural panel.

05 Panel Hinges:

a. Panel hinges shall be architectural grade, full leaf butt hinges.

b. Hinges shall be attached to steel frame utilizing a steel mounting bracket welded to frame.

c. Bottom hinge shall be located 7'-0" A.F.F. for partition heights over 16'-0".

d. Hinges shall be attached to the steel frame of the panel and reinforced with a steel backer plate.

06 Panel Weight: Maximum panel weight shall be 6.5 – 12.0 PSF depending on STC rating, size and options selected.

C. Operation:

01 Operation shall be Continuously Hinged / Electric, consisting of panels hinged together forming a continuous panel train.

02 Panels shall be top-supported by one (1) carrier in each panel, consisting of four (4) permanently lubricated, precision ground ball bearing polished steel wheels riding on a steel tread surface.

03 Panels shall be operated between stacking location and installed position by an electric operator, which connects to lead panel by #50 roller chain.

04 A manual override shall be included in the event of a power failure to allow the operable wall system to be manually operated.

05 Drive System:

a. Standard Electric Motor: consisting of a 1 Horsepower (.746 kw), 115 volt, 1 Phase, 60 Hz capacitance wound motor.

b. Optional Electric Motor: consisting of a 1 Horsepower (.746 kw), 208 volt, 3 Phase, 60 Hz capacitance wound motor.

D. Activation:

01 Activation of the operator shall be controlled by a two (2) position (low voltage) key switch to arm the system.

02 Control of the operator shall consist of two (2) stations with extend and retract constant-pressure push button switches.

03 Switches shall be low voltage, wired in series, and located on opposite sides and ends of the partition.

04 Electric operator shall include safety devices (limit switches) to automatically shut off the operator at the fully extended and fully retracted position.

05 Operator shall be located at the opposite end of stack area off center to the side of the partition.

06 All electric operator components shall be modularized for easy replacement in the field without removing the surrounding components and NFPA 70 approved.
07 Access panels to the operator unit and return sprockets are required for adjustment and maintenance purposes, as provided by others.
08 Electric operator shall consist of Standard Speed Reducer Drive: consisting of a 50 to 1 ratio worm gear, adjustable clutch and 1 H.P. (.746 kw) electric motor. Speed reducer drive system shall be capable of moving a wall system up to 600 SF.

E. Stack Arrangement:
01 Stack Type: Panel storage configuration shall be Center Stack, consisting of panels stacked on center to the wall's installed position.
02 Stack Quantity: Panels shall be stored at one end or both ends as indicated on the Drawings.

F. Finishes:
01 Panel Finish Material: Shall be Class A rated in accordance with ASTM E84.
02 Standard Finish: Vinyl as selected by the Architect from manufacturer’s full range of vinyl selections
a. Type II, reinforced vinyl
b. Total Weight: 21 OZ / linear yard
c. Gauge: 24 Mil
d. Fire Testing: Class A Rating
e. Mets requirements for flame spread, smoke density and flashover
f. UL Labeled and Listed
g. Vinyl shall meet or exceed CCC-W-408A quality standards

G. Perimeter Trim and Seals
01 Vertical Trim and Seals: Panels shall have vertical astragals containing flexible vinyl seals and incorporate reversible tongue-and-groove-type configurations for positive interlocking with adjacent panels.
02 Vertical astragal type shall be standard trim-less astragal: consisting of an aluminum extrusion with tongue-and-groove-type vertical astragals.
a. Vertical trim shall not be permitted on the panel faces, resulting in a minimal groove appearance between adjacent panels.
03 Horizontal Top Trim and Seals: Top seals shall consist of flexible vinyl sweep seals installed on both sides of the panel.
a. The seals shall consist of a compressed bulb between two (2) fingers of vinyl.
b. Top seal type shall be standard fixed top seals: consisting of continuous-contact flexible vinyl sealing against the bottom flange of the overhead track.
04 Horizontal Bottom Trim and Seals: Bottom seals shall consist of multiple fingers of flexible vinyl for positive contact and sealing with various floor surfaces.
a. Bottom seal type shall be an automatic bottom seals: consisting of self-activated seals providing 2” of nominal travel.
05 Horizontal and Vertical Panel Trim: All exposed panel trim and hinges shall be of one (1) similar color:
a. Grey

H. Closure System

01 Initial Closure System: The lead panel (the first panel exiting the stack) shall form a seal vertically against a rigid wall surface, as accomplished by an Adjustable-Compensating Closure containing two (2) continuous-contact, flexible vinyl bulb seals installed along the vertical edge of the lead panel for positive compression against a rigid wall surface.

a. Initial closure panel shall contain a flush pull handle on each side.

02 Final Closure System: The final closure panel (the last panel exiting the stack) shall form a seal vertically against a rigid wall surface.

a. Final closure shall be accomplished by a manually activated half panel that does not require any attachment to the permanent wall.

b. The Half Panel and its two (2) immediately adjacent panels will incorporate adjustable bottom seals, and the first panel adjacent to the half panel shall contain a flush pull handle. The type of final closure panel shall be (select):

c. A half panel inter-lock limit switch shall prevent the operable wall from being retracted until the half panel and adjacent panel are partially folded.

I. Pocket Door: Where indicated on the Drawings provide an operable wall pocket door assembly specifically designed to operate and interface with the operable wall assembly.

01 Assembly shall include door and frame.

02 Single Door with Expander: Single panel hinged to an adjustable jamb.

03 Lead edge of the panel shall contain an expander mechanism with a nominal 5” of travel, activated from the face of the door panel using a removable wrench.

04 Pocket door shall be faced with plastic laminate as selected by the Architect from manufacturer’s full range of finishes.

05 Provide with keyed cylinder lock capable of being keyed to Owner’s master keying system. Coordinate with hardware supplier as required.

J. Panel Accessories: Where shown on the Drawings, provide the following accessories integrated into the operable wall panel assembly:

01 Dry Marker Writing Surface: Provide in height and location(s) as indicated on the Drawings.

a. Provide a recessed eraser / marker tray adjacent to each writing surface.

02 Single Pass Door: Provide in size and location(s) as indicated on the Drawings.

a. Door shall be ADA / TAS compliant.

b. Provide with keyed cylinder lock capable of being keyed to Owner’s master keying system. Coordinate with hardware supplier as required.

K. Hardware:

01 Pulls: Satin chrome, blade type.

02 Latch: Operable from both sides.

03 Locks: Master keyed to Owner’s keying system. Owner shall provide final key core. Coordinate with Section 08 71 00 – Door Hardware as required.

2.3 SAFETY DEVICES

A. Safety devices shall be Kwik-Wall Guardian Personnel Protection System which shall automatically shut off the operable wall and prevent movement until the system is reset at the control box.

B. Lead Sensing Edge: consisting of a Lead Sensing Edge (approximately 5'-0" long) located on lead edge of the operable wall.

C. Lead Sensing Edge shall be wired to a wireless transmitter when activated an alarm will sound and shut the operable wall system off immediately.

2.4 TRACK AND SUSPENSION SYSTEM

A. Track System: Standard continuously hinged operable partition:
   01 Type H.D. Continuously Hinged / Electric Steel Track: The Continuously Hinged / Electric Steel track running surface shall be made of cold-rolled, high carbon steel tread surfaces to facilitate ease of panel movement and operation.
   02 Track system shall not require a panel guide to straighten out the wall system.
   03 The steel tread surface shall be contained within a continuous structural track housing extruded from aluminum, which prohibits deterioration caused by rust or corrosion.
   04 The track housing shall have a durable anodized clear satin finish, which resists color fading and flaking.
   05 The track housing shall utilize grooves and interlocking steel pins for positive alignment of adjacent track sections and shall be reinforced overhead by a heavy-duty steel bracket made of hot-rolled, 3/8" thick plate steel.
   06 Aluminum track housing shall include an integral nut slot to accept a hardened steel square nut to facilitate attachment of each steel all-rod and splice brackets to the overhead structural support.

B. Carrier System:
   01 Type H.D. Continuously Hinged / Electric Steel Wheel Carrier: Each Continuously Hinged / Electric panel shall be top supported by one (1) carrier, utilizing a 5/8" diameter pendant bolt.
   02 Each top carrier shall consist of four (4) permanently-lubricated, precision ball bearing polished steel wheels, as required for smooth and quiet operation.
   03 Floating bottom carrier shall consist of two (2) offset, permanently-lubricated, precision ground ball bearing steel wheels riding in a structural rectangular steel tube with 3/8” diameter steel guide rails.
   04 Carrier shall utilize a constant-force spring allowing it to travel back and forth within the steel tube.

C. Suspension System:
   01 The track shall be suspended by steel Drop Rods, consisting of adjustable rods of grade 2, 3/8" diameter threaded steel all-rod provided with 3/8" serrated steel nuts.
   02 The jamb activator shall be located approximately 45” from the floor in the panel face and be accessed from either side of the panel.
   03 The jamb is equipped with a mechanical rack and pinion gear drive mechanism and shall extend 4”-6” by turning the removable operating handle.

D. Stack / Store Panels:
   01 Refer to Drawings for stack / storage provisions for panels.
   02 Provide appropriate track system for stack / storage configuration indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Operable wall manufacturer shall coordinate with Contractor and other trades during the submittal phase to ensure proper interface of operable partition assembly with the following:
   01 Concrete slab and finish flooring to delineate level tolerances.

02 Supporting structural assembly at head.
03 Finish hardware to be provided by others.
04 Adjacent gypsum board and / or acoustical lay-in ceiling systems.

B. Field verify that all conditions at flooring, structural system supporting the operable partition track and adjacent gypsum board, and / or acoustical ceiling assemblies are complete and correct for the proper installation and interface with the operable partition.

C. Notify Contractor of any deficiencies and / or discrepancies and do not proceed with installation until fully resolved.

3.2 INSTALLATION

A. The complete installation of the operable partition shall be by the manufacturer's authorized factory-trained installer.

B. Install in strict accordance with the final, reviewed submittals, shop drawings and manufacturer's standard printed specifications, instructions, and recommendations.

C. Install the work of this Section in strict accordance with pertinent requirements of governmental agencies, ASTM C557-77.

D. Upon completion of all operable partition components, provide all necessary adjustment required for proper and smooth operations of the assembly.

E. Fully test partition as required to confirm proper and smooth operation.
01 Testing shall consist of minimum of ten (10) cycles of fully opening and closing the operable wall assembly.

F. Upon completion of installation and testing, protect door from damage from work by other trades.

G. Demonstration:
01 Coordinate with Contractor and Owner to schedule a complete demonstration of all proper operations and maintenance of the operable partition assembly.
02 All operations and maintenance manuals must be reviewed and accepted by the Architect and delivered to the Owner prior to the Owner demonstration.

END OF SECTION

SECTION 10 26 13

CORNER GUARDS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 This Section includes the furnishing and installation of textured vinyl corner guards at all painted and vinyl wall covering finished outside corners of drywall partitions in corridors, traffic areas and other locations as indicated on the Drawings. Ceramic tiled walls are excluded.
   02 Provide stainless steel corner guards at all outside corners in food service and serving areas.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. ASTM International:
   01 ASTM B221-73 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   02 ASTM D2287 – Standard Specification for Non-Rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
   03 ASTM E84-81a – Standard Test Method for Surface Burning Characteristics Of Building Materials.
   04 ASTM D256-10 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of corner guards is based on products manufactured by AFCO.

B. The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Balco, Inc.
   02 Pawling Systems
   03 ProTek Systems

2.2 MATERIALS – STANDARD VINYL CORNER GUARDS

A. Vinyl Corner Guards: Design of corner guards is based on AFCO “Electra” series corner guards.
   01 Corner guards shall be minimum 0.093” thick textured vinyl material.
   02 Fire Performance Characteristics: ASTM E84 Class 1, Flame Spread 15.
   03 Impact Resistance: 15 ft. lb./ sq. inch as tested per ASTM D256.
   04 Size: 3” x 3” x height of wall” unless otherwise noted.
   05 Color as selected by the Architect from manufacturer’s full range of color selections.
   06 Shape: 90, 45 and 135 degrees, as required, secured with stainless steel self-tapping pan head screws at 18 inches O.C., vertical both sides.

2.3 MATERIALS – STAINLESS STEEL CORNER GUARDS

A. Stainless Corner Guards: Design of corner guards is based on AFCO “Lunar” series corner guards.
   01 Material: Type 304 stainless steel; #4 satin finish.
   02 Thickness: minimum 0.050”.
   03 Fire Performance Characteristics: ASTM E84 Class 1, Flame Spread 15.
   04 Impact Resistance: 15 ft. lb./ sq. inch as tested per ASTM D256.
   05 Size: 2-1/2” x 2-1/2” x height of wall” unless otherwise noted.
   06 Shape: 90, 45 and 135 degrees, as required, secured with stainless steel self-tapping pan head screws at 18 inches O.C., vertical both sides.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Corner Guards: Locate corner guards at all outside corners in corridors.

B. Anchor for appropriate substrate, and in compliance with the manufacturer's instructions.

C. Install corner guards level and plumb at the height indicated on the Drawings, with surfaces free from distortion or other defects in appearance.

B. Cleaning: At completion of the installation, clean surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 44 00

TOILET, BATH AND LAUNDRY ACCESSORIES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Furnish and install toilet and bath accessories as indicated or scheduled on the Drawings or specified herein.
   02 Installation of Items Provided by Owner:
      a. Soap dispensers - surface mounted.
      b. Paper towels dispensers - surface mounted.
   03 Furnish and install electric hand dryers as indicated or scheduled on the Drawings or specified herein.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 09 21 16 – Gypsum Board Assemblies
   03 Section 10 21 13.19 – Plastic Toilet Partitions

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM international:
   01 ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   02 ASTM A480 – Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
   03 ASTM B177 – Standard Guide for Engineering Chromium Electroplating.
   04 ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of ten (10) years successful experience manufacturing similar products.

B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

D. Hazardous Materials: Comply with EU Directive “Restrictions of Hazardous Substances (RoHS) requirements.”

1.5 WARRANTY

A. Provide a written warranty for all provided stainless steel components covering the stainless steel finish against rust and / or rust spots for a period of two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of toilet accessories is based on products manufactured by Bobrick and Bradley as noted.

B. The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 A & J Washroom Accessories
   02 American Specialties
   03 Bradley
   04 Charles Parker Co.
   05 GAMCO, General Accessory Mfg. Co.
   06 Watrous, Inc.

C. Specified products listed by other manufacturers comply with district standards and are listed as no substitutions.

2.2 MATERIALS

A. Stainless Steel:
   01 Alloy: AISI, Type 302 or 304 (18-08) ASTM A167.
   02 Finish: No. 4 satin, unless otherwise specified.
   03 Thickness: US Stainless 22 gauge minimum.

B. Aluminum:
   01 Extruded: 6463-T5 alloy, anodized.
   02 Cast: 356 or 356-T6 alloy.

C. Chromium Plating:
   01 Method: Over nickel.
   02 Standard: ASTM B177, Type SC 2.

D. Brass:
   01 Cast or forged.
   02 QQ-B-626C.

E. Mirrors: (Framed)
   01 Standard: Federal Standard A-A-3002.
   02 Glass thickness: 1/4 inch minimum.
   03 Backing: Electrolytic cooper.
   04 Protection: Padding and filler strips.
   05 Frame: Type 304 stainless steel, satin finish.

PART 3 - EXECUTION

3.1 MOUNTING LOCATIONS

A. Refer to Drawings for mounting locations. When not shown, submit supplier's recommendations for locations and mounting height before proceeding.
   01 For Owner Furnished Contractor Installed (OFCI) accessories, coordinate with Owner to obtain cut sheets and mounting instructions for all accessories.

B. Coordinate with other trades as required for opening sizes for recessed and semi-recessed accessories, installation of blocking in walls, and electrical connections to accommodate the installation of all toilet and bath accessories.
   01 All wood blocking shall be treated.
   02 Wood blocking shall be sized to accommodate anchorage of toilet accessory and provide minimum toilet accessory weight requirements.
      a. Grab Bars: 250 LBS
      b. Shower Seats: 360 LBS.

3.2 INSTALLATION

A. Install all toilet and bath accessories in strict accordance with manufacturer's standards and recommendations.

B. Use concealed fastening where possible; and where not possible, use approved theft-resistant type fasteners for anchoring toilet accessories.

C. Comply with ADA requirements.

PART 4 - SCHEDULES

4.1 ITEM LIST

A. As a quality standard, model numbers shown are Bobrick Washroom Equipment unless indicated otherwise.

B. TA-1 – Wall Mounted Soap Dispensers:
- 01 Bradley 6563 Liquid Soap Dispenser
- 02 Location - Single Sink: One (1) at each sink.
- 03 Location – Gang Sinks: As indicated on the drawings; but not less than one (1) dispenser at every two (2) sinks.

C. TA-2 – Mirrors:
- 01 Bobrick Model No.: Series 165 stainless steel framed mirror without shelf.
- 02 Mounting: Surface with concealed fasteners.
- 03 Single-Use Restrooms and Other Single Sinks Minimum 24" x 36". Refer to Drawings for locations.
- 04 Gang Restroom Full Height Mirrors: Minimum 24" x 60". Refer to Drawings for locations.

D. TA-3 – Paper Towel Dispenser C-Fold:
- 01 Owner Furnished - Contractor Installed.

E. TA-5 – Toilet Paper Dispenser - Roll:
- 01 Bobrick: 2740 Double Roll Dispenser.
- 02 Mounting: Surface.
- 03 Location: One at each toilet.
- 04 Aluminum with satin finish body.
- 05 Plastic spindles with concealed locking device.
- 06 Mounting: Surface with concealed fasteners.

F. TA-6 – Grab Bars – Toilet Compartments:
- 01 Standard Accessible Stall: Bobrick Model No.: B-6806.99 x 36 and x 42 in each 60" wide standard accessible stall.
  - a. At toilets where flush valve assembly interferes with accessible mounting height of rear grab bar, provide Bobrick model no.: B6806.99 x 12" and x 24" mounted on either side of the flush valve.
  - b. Field verify all conditions.
- 02 Ambulatory Accessible Stall: Bobrick Model No.: B-6806.99 x 42 (2) in each 36" wide ambulatory accessible stall.
- 03 Mounting: Surface with concealed fasteners and theft-proof covers.

G. TA-7 – Mop and Broom Holder:
- 01 Bobrick Model No.: B-223 x 36, four holders.
- 02 Mounting: Surface.
- 03 Location: One at each mop sink, whether indicated or not.

H. TA-8 – Clothes Hooks:
   01 Bobrick Model: B-233.
   02 Mounting: Surface (48” AFF).
   03 Location: One at each toilet stall door, whether indicated or not and one (1) at single use restrooms mounted on back of solid core wood door.

I. TA-9 – Feminine Napkin Dispenser: Not Used

J. TA-10 – Feminine Napkin Disposal:
   01 Provided and installed by Owner.

K. TA-11 - Grab Bars – Shower Compartments:
   01 Model: B-6806-24 and B-6806-30.
   02 Mounting: Surface with concealed fasteners and theft-proof covers.
   03 Location: One at each H.C. shower at 33”-36” AFF.

L. TA-12 – Fold ng Bench – Shower Compartments:
   01 Bobrick Model: B-5181.
   02 Mounting: Surface.
   03 Location: One at each H.C. shower at 18” AFF to top of bench.

M. TA-13 – Shower Curtains and Rods: Not Used

N. TA-15 – Electric Hand Dryer:
   01 Dyson Model: Airblade V.
   02 Mounting: Recessed with concealed fasteners (maximum 4” protrusion from wall.
   03 Hands free nickel Body.
   04 Electrical: 120 volt / 1,000 watt; no heat.
   05 Hands free with HEPA filter.
   06 Location at Multi-Use Restrooms: two (2). Refer to Drawings.
   07 Location at Single Use Restrooms: one (1). Refer to Drawings.

O. TA-16 – Baby Changing Station:
   01 Bobrick / Koala Kare Model: KB-200.
   02 Polypropylene body with steel hinge system, and complete with liner dispenser and liners.
   03 Mounting: Surface with concealed fasteners.
   04 Height above finish floor: 32” to bottom of unit.

P. TA-17 – Mop and Broom Holder
   01 Bobrick Model: B-224 x 36.
   02 Mounting: Surface.
   03 With utility shelf, 4 mop and broom holders and 3 rag hooks
   04 Location: One at each room with a mop sink.

Q. TA-18 – Roll-In Shower Compartment: Not Used

R. TA-19 – Accessible Toilet Stall: Not Used

S. TA-20 – Ambulatory Toilet Stall: Not Used

T. TA-21 – Shower Water Retainer: Not Used

END OF SECTION

SECTION 10 44 13

FIRE EXTINGUISHERS AND CABINETS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide fully recessed fire extinguisher cabinets where indicated on the Drawings.
   02 Provide fire extinguisher wall brackets at all mechanical rooms, main electrical room, central plant and MDF Room.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes.

G. Operations and Maintenance Manuals
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of fire extinguisher cabinets and fire extinguishers is based on products manufactured by JL Industries.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Apex
   02 Potter Roemer
   03 Uline

2.2 MATERIALS

A. Fire Extinguisher Cabinets: Design is based on JL Industries Cosmopolitan Series, semi-recessed cabinets with 1-1/2” projection, model number 1836V – Vertical Duo.
   01 24” x 10- 1/2” x 5-1/2” inside box dimension.
   02 Semi-recessed type with 1-1/2 inch return trim, square edge with eased corners.
   03 Stainless steel door with handle and silk-screened lettering “Fire Extinguisher” with wire glass.
   04 Hinge: Concealed.
   05 Provide a handle and magnetic catch.
   06 Finish of Exterior: Stainless steel.
   07 Finish of Interior: Standard.
   08 All fire extinguisher cabinets shall be furnished with 10 lb. fire extinguisher.

B. Wall Mount Brackets:
   01 Provide manufacturer’s standard fire extinguisher wall bracket specifically suited for support of wall mounted fire extinguishers.

C. Fire Extinguishers (Standard):
   01 Multi-purpose dry chemical with UL 4A-60B:C and FM approved; UL 2A-10B:C for 5 and 10 lbs.
   02 Capacity: 5 lb. At mechanical rooms and direct wall mounted extinguishers; and 10 lb. at fire extinguisher cabinets.
   03 Extinguishers are furnished for direct wall mounting and for fire extinguisher cabinets. Refer to Drawings for location and quantity.
   04 Provide initial inspection tag for each extinguisher.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate with other trades as required for installation of rough openings / recesses in walls to receive fire extinguisher cabinets.

B. Coordinate with other trades as required for installation of all blocking in walls necessary for proper installation of fire extinguisher cabinets and wall mounted brackets.

3.2 INSTALLATION

A. Install fire extinguisher cabinets in strict accordance with manufacturer's standards and final reviewed submittals.

B. Install fire extinguishers at all cabinets and wall hung locations.

C. Provide initial inspection tag for each extinguisher immediately prior to Substantial Completion.

END OF SECTION

SECTION 10 51 13

METAL LOCKERS AND BENCHES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide standard metal lockers in quantities and locations as indicated on the Drawings.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 04 20 00 – Unit Masonry

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembly components.
   02 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 2" x 2" but must be large enough to convey attributes of the proposed product.

F. Locations and quantity of ADA compliant lockers with approved graphics.

1.3 WARRANTY

A. Warrant the work specified herein against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.
   01 Warranty Period: Ten (10) years from Substantial Completion.

B. Defects shall include, but not be limited to the following:
   01 Rapid deterioration of finish.
   02 Loose or missing parts.
   03 Non-functioning components and mechanisms.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Lockers and Wood Benches are based on products manufactured by Republic Storage Systems, Inc.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Debourgh
   02 Republic Storage Systems
   03 List Industries, Inc.
   04 Penco Products
   05 Lyon

2.2 LOCKER TYPES AND CONFIGURATIONS

A. Standard Lockers:
   01 Locker Type B – Food Service Staff:
      a. 12” x 12” x 36”.
      b. Double tier 72” overall ht. (excluding base and cap).

2.3 STANDARD LOCKERS

A. Materials:
   01 Steel: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of high gloss baked enamel.
   02 Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slotless type; self-locking nuts or lock washers.
   03 Equipment:
      a. Hardware: Hooks and hang rods of cadmium plated or zinc plated steel or cast aluminum.
      b. Handle: Stainless Steel recessed handle.
      c. Number Plates: To be polished aluminum with not less than 3/8 inch high etched numbers attached to door with two (2) aluminum rivets.

B. Fabrication:

01 General: Fabricate lockers square, rigid and without warp, with metal faces flat and free from dents or distortion. Make all exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections as standard with manufacturer. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors or frames.

02 Finishing: All locker parts to be cleaned and coated after fabrication with a seven (7) stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high-grade enamel electrostatically sprayed and baked at 325°F for a minimum of 30 minutes to provide a tough durable finish. Color shall be as selected by Architect from manufacturer's standard colors.

a. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one (1) standard color and the doors chosen from a second standard color.

03 Doors to be solid (no ventilating louvers or perforations). All body parts solid.

04 Frame: Fabricate of 14 gauge (minimum) channels, with integral continuous door stop / strike formed on vertical members.

05 Wardrobe Doors: Outer door to be fabricated from single sheet prime 14 gauge with 7/8 inch double bends at top and bottom and 3/4 inch double bends at the sides with a minimum 3 inches wide 18 gauge full height channel door stiffener MIG welded to the inside of door face at the hinge side as well as the top and bottom return bends.

06 Door Recessed Locker Handle: All locker doors shall have recessed stainless steel cup and handle shaped to receive a built-in combination lock. The recess pan shall be deep enough to have the lock be flush with the outer door face. The pull handle shall be the full width of the recess pan, fabricated of stainless steel and be welded to the recess pan flush with the door face for easy opening of the locker door.

07 Latch Assembly: Shall be single point rigid non-moving positive latch by means of a heavy gauge (minimum 12 gauge) latch securely welded to the 14 gauge vertical frame member. The latch assembly must be made of a single piece of steel and have a padlock or built-in combination lock. A pry resistant lug which inserts into the door shall be an integral part of the 12 gauge latch. Rubber bumpers shall be securely attached to the door strike. If built-in locks are to be used on openings 30 inches high or higher, a 14 gauge horizontal support channel (HAS) shall be bolted to the side panel and the back side of the latch as reinforcement.

08 Door Hinges: Shall be continuous hinges – no exceptions.

09 Body: Fabricate back and sides of 24 gauge (minimum) sheet steel, with double flanged connections extending full height, form top, bottom and intermediate tier dividers of 24 gauge (minimum) sheet steel with single return bends at all sides. Bolt to front horizontal frame members in addition to side panels. Form hat shelves at single tier lockers of 24 gauge (minimum) sheet steel with single bends at sides and back and a double bend at front.

10 Locks:

a. Master #1630 Series Combination Locks (Spring Bolt Action) with key override. Provide five (5) master / control keys.

b. Provide one accessible lock at one ADA / accessible locker per governing authorities.

11 Equipment: Furnish each locker with the following items, unless otherwise shown.

a. Double tier lockers: One (1) double prong ceiling hook and not less than three (3) single prong wall hooks. (Two (2) single prong wall hooks only at nine (9) inches wide).

12 Finished End Panels (if applicable): Shall be “Boxed” type formed from 16 gauge cold rolled steel with 1/2 inch O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. End panels must be formed with slope at top to cover the ends of the continuous slop tops. Finish to match lockers. Provide at all exposed ends.

13 Continuous Slope Tops (if required): Not less than 20 gauge sheet steel, approximately 18 degrees pitch, in lengths as long as practical but not less than four (4) lockers. To be installed in addition to the locker flat top with end closures for support. Finish to match lockers.

14 Fillers: Provide where indicated, of not less than 18 gauge sheet steel, factory fabricated and finished to match lockers.

15 Approved Product: “Republic Single Point Latch” knock-down corridor lockers in types, sizes, and locations as shown on drawings.

16 Provide required accessible quantity of each type of locker (minimum 5 percent – rounded up in each cluster) to comply with ADA and TAS requirements. Include intermediate bottom shelf and ADA / TAS approved locking mechanism.

2.4 LOCKER BASES

A. All lockers shall be installed on a continuous, cast-in-place concrete base in configuration as indicated on the Drawings.

01 If not indicated, base shall be 4 inches tall by depth required by locker manufacturer for proper installation.

B. Concrete bases shall include continuous, embedded treated 2x lumber for anchoring lockers.

C. Coordinate with Contractor / other trades as required for proper installation of locker bases.

PART 3 - EXECUTION

3.1 PREPARATION / COORDINATION

A. Coordinate with Contractor and other trades as required for proper installation of concrete bases required at lockers.

3.2 INSTALLATION

A. Assemble lockers in accordance with the manufacturer’s written instructions. Lockers shall have no sharp metal edges.

B. Install lockers and benches plumb, level, and flush in the locations shown on the Drawings in accordance with the manufacturer’s instructions.

C. Anchor lockers to the floor and wall as recommended by the manufacturer.

D. Install slope hoods, metal fillers, end panels and trim to close openings, and accessories using concealed fasteners. Provide flush hairline joints against adjacent surfaces.

E. Install number plates in order as directed by the Architect.

F. Install benches where indicated on the Drawings. Secure bench to floor to provide fixed installation.

3.3 ADJUST AND CLEAN

A. Adjust doors and latches to operate without binding and positive latching and automatic locking.

B. Touch up marred finishes with factory-supplied paint.

END OF SECTION

SECTION 10 56 26

MOBILE STORAGE SHELVING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide all steel mobile storage shelving units indicated on the Drawings or specified herein.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 05 50 00 – Metal Fabrications
   03 Section 06 10 00 – Rough Carpentry
   04 Section 09 21 16 – Gypsum Board Assemblies

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of mobile storage shelving is based on products manufactured by Uline.

B. The following additional manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
   01 Dixie Shelving Co.
   02 Global Industrial

03 Lyon-MF
04 Penco

2.2 MATERIALS

A. Design of mobile storage shelving is based on Uline Heavy-Duty Steel Shelving.

B. General:
01 Adjustable heavy-duty open shelves.
02 Nominal Height: 85".
03 Minimum Shelf Capacity: 400 lbs. uniformly distributed load.

C. Shelf Unit Components:
01 Corner Post: 14 gauge minimum.
02 Shelf Gauge: 16 gauge minimum.
03 Shelves: Seven shelves total, including top and bottom.
04 Two pair side sway braces per unit.
05 One pair back sway braces per unit.

D. Sizes: Provide sizes (width and depth) as indicated on the Drawings.

E. Finish: Gray powder coat paint, factory applied.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install shelving units in accordance with manufacturer's printed instructions.

B. Secure wall units to walls in a minimum of two places per unit. Connection can be made with angle brackets.
01 At metal framed wall conditions, assure connection at wall is made into a stud.
02 Connection into gyp board (alone) or use of expansion anchors is not acceptable.

C. Refer to Drawings for locations and quantities.

D. Install bottom shelf 1'-0" above finish floor.

END OF SECTION

SECTION 10 73 26

ALUMINUM WALKWAY COVERINGS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide walkway canopy systems / assemblies in the configurations and heights indicated on the Drawings.
   02 All walkway canopies shall be engineered by Structural Engineer licensed in the State of Texas to meet all applicable codes.
   03 All walkway canopies shall be engineered to meet minimum wind load criterion established for this project.
   04 Design of walkway column / post footings shall be included. Coordinate with the Contractor for installation responsibility.

C. Related Work:
   01 Section 02 32 00 – Geotechnical Report
   02 Section 03 30 00 – Cast-In-Place Concrete
   03 Section 32 13 13 – Concrete Paving and Flatwork
   04 Division 26 – Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

1.3 REFERENCE STANDARDS

A. ASTM International:
   01 ASTM B221 – 08 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   02 ASTM B429/B429M – 06 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

B. Aluminum Association: AA-MIO-C22-A21 – Aluminum Design Manual 2005, The Aluminum Association.

C. ASCE/SEI 7-05 Minimum Design Loads for Buildings and Other Structures.

D. AAMA – American Architectural Manufacturers Association.

E. AWS D1.2/D1.2M:2003, Structural Welding Code – Aluminum.

F. Underwriters Laboratories – Class A Fire Rating.

1.4 SYSTEM REQUIREMENTS

A. Aluminum walkway covers shall be a complete, engineered canopy system comprised of support columns, cross beams, bent framed, decking and fascia trim.
   01 Refer to Drawings to layout, configurations and heights.

B. All aluminum walkway covers shall be designed and engineered to meet minimum wind load criterion established for this project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of aluminum walkway canopies is based on products / systems / assemblies of Avadek Walkway Cover Systems and Canopies.

B. The following manufacturers are acceptable to provide work of this Section provided all proposed products meet or exceed specified requirements:
   01 Aluminum Techniques
   02 Canopy Solutions
   03 The Chism Company
   04 Eastern Metal Supply
   05 East Texas Canopy

06 Rusco Custom Canopies
07 Superior Metal Products Co.

2.2 MATERIALS

A. Aluminum extrusions shall be as designed by manufacturer and appropriate for intended use.
01 6005-T6.
02 6061-T6.
03 6063-T5.
04 6063-T6.
05 All alloys shall be in accordance with ASTM B221.

B. Provide minimum 6” x 6” columns and 6” x 10” beams at bents, or larger if shown on the Drawings and / or if required by engineering to meet codes and wind loads.
01 If subsurface drains drainage is not indicated on the Drawings, provide drainage at least at every other column on one side of the walkway canopy only.
02 Drainage shall be away from the building; and conform to drainage patterns as indicated on the Drawings.

C. Structure shall be designed by the manufacturer to withstand walking on top, heavy hail, and hurricane winds, in the configurations as shown on Drawings.

D. Provide concealed drainage from deck into gutters and into bents, for discharge at slab, trench drain or subsurface level as indicated on the Drawings.
01 At Surface Drains: Provide angled, aluminum diverter welded in the base of the column to divert water onto adjacent surface.
02 At Trench Drains: Provide extended column to extend flush with top of trench drain cover.
03 At Subsurface Drains: Provide a horizontal, round aluminum, 12” long boot welded to side of column at required elevation to interface with subsurface storm drain system.
04 Provide threaded end for PVC/SDR fitting to connection to subsurface storm system.
05 Flexible Fernco or equal type fittings are NOT allowed. Coordinate with other trades as required for size, location and depth.

E. Bent Construction: Beams and columns shall be welded into one-piece rigid bents in the manufacturer’s shop. Extended structural ties shall be rigidly installed in tops of all beams, also serving as closures between draining deck sections.
01 Provide in design and configuration as indicated on the Drawings.

F. Fixed Canopy Louvers:
01 Provide fixed canopy louvers in conjunction with walkway canopies where indicated on the Drawings.
02 Louver elements shall be 2” x 6” rectangular aluminum tubing with end caps.
03 All splices shall be located above the supporting bent structure.

G. Canopy Roof Deck:
01 Minimum Panel Overall Profile Height: 4-1/2”.
02 Roof sections shall interlock in a homogeneous structural unit, with joint designed and fabricated into a structurally rigid shape which is self-flashing.
03 No protruding ribs on the underside of deck is permissible.

H. Fascia: 8” height. 10” height.

I. Finishes: finishes of each component shall be as selected by the Architect from manufacturer's full range of colors samples.
   01 Anodized Finish: Clear, champagne, bronze or black. Minimum Class I, 0.7 mils, 215 R-1, AA-C22A41.

J. Expansion Joints: Provide expansion joints as required. Expansion joints shall have no metal-to-metal contact.

2.3 FOUNDATIONS

A. Design of footings at canopy columns shall be the responsibility of the canopy manufacturer.

B. Footings shall be designed to support all dead loads, live loads at a minimum of 20 PSF, and as required to meet specified wind load / uplift.

C. Coordinate as required for preparation and installation of canopy footings.

2.4 DRAINAGE SYSTEMS

A. Drainage Above Grade / Flatwork:
   01 Provide openings in base of columns: with bottom of opening +/- 4" above grade or concrete flatwork where indicated on the Drawings.
   02 If not indicated, provide drainage at a minimum of every other column on canopy side away from the building toward the nearest paving.
   03 Provide a minimum 1/4" thick diverter plate welded continuous into base of drainage columns to provide positive diversion of water out of drainage opening.

B. Drainage Below Grade:
   01 Provide opening in drainage columns below grade.
   02 Provide a minimum 1/4" thick diverter plate welded continuous into base of drainage columns to provide positive diversion of water out of drainage opening.
   03 At column opening, provide a round aluminum boot, 12" in length, welded continuous onto face of column at drainage opening below grade and threaded on the outer end to connect with PVC/SDR female threaded fitting.
   04 Diameter of boot shall be equal to sub-surface drainage pipe shown to connect to drainage column. Refer to Civil Storm Sewer Drawings.
   05 Connection to underground storm drain pipe shall be accomplished with a female threaded PVC/SDR fitting. Flexible Fernco or equal type fittings are NOT allowed.
   06 Column footing shall be below drainage connection; adjust column length as required.
   07 Coordinate with other trades as required to properly locate and connect the drainage boot.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install at locations shown on the Drawings.

B. Provide concrete footings in accordance with engineer's signed and sealed Shop Drawings.

C. Follow manufacturer's printed instructions.

D. Coordinate dimensional requirements prior to fabrication.

3.2 ERECTION

A. Erection shall be in accordance with manufacturer's recommendations.
   01 Erectors shall be manufacturer approved.

B. Erect after all structural concrete and masonry in vicinity is complete and washed down.

C. Column sleeves shall be furnished by the manufacturer and installed by the General Contractor, to elevations and dimensions on approved Shop Drawings.

D. Erect all bents straight and true. Protect columns with heavy plastic sheeting.

E. Install all flashing required at the juncture of deck sections.

3.3 CLEANING AND PROTECTION

A. Remove all protective sheeting from metal panels and fascia.

B. Care shall be taken to prevent damage or scratching. Damaged or scratched components will not be accepted.

END OF SECTION

SECTION 10 75 00

FLAGPOLES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide aluminum flagpole(s) where indicated on the Drawings.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 31 20 00 – Earth Moving

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembly components.
   02 Show details of field fabrications, connections and details.
   03 Provide calculations demonstrating compliance with wind load and other requirements.
   04 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

1.3 REFERENCE STANDARDS

A. ASTM International:
   01 ASTM B221 – 08 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   02 ASTM B429 / B429M – 06 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

B. Aluminum Association: AA-MIO-C22-A21 – Aluminum Design Manual 2005, The Aluminum Association.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of Flagpoles is based on products manufactured by Morgan-Francis Co.

B. The following manufacturers are acceptable to provide work of this Section, provided the proposed products meet or exceed all specified requirements:
   01 American Flagpole.
   02 Baartol Company, Inc.
   03 Concord Industries.
   04 EMC
   05 Eder Flag Manufacturing
   06 Morgan-Francis Company, AABEC Pole Division

2.2 MATERIALS

A. Flagpole shall be designed as specified and as required to withstand a minimum 120 MPH sustained wind speed.

B. Tapered Aluminum Flagpole:
   01 Provide all standard fittings for a complete installation.
   02 Standard type 35'-0" exposed height above ground; nominal 38’-6” overall height.
   03 Outside butt diameter: 7” minimum.
   04 Outside top diameter: 3-1/4” minimum.
   05 Wall thickness: .188 inches minimum.
   06 Seamless extruded ASTM B241 6063-T6 cold drawn aluminum body, escutcheons, and fittings.
   07 Pole surface: 80 grit clear anodized satin finish.
   08 Provide metal base / escutcheon at base of pole.
   09 Finial: 6" dia. Ball / gold anodized aluminum.
   10 Clear anodized aluminum, clear cover with cylinder lock.
   11 Halyards: Nylon with metal core.
   12 Ball-bearing, non-fouling, revolving truck assembly.
   13 Provide required hardware to accommodate two (2) 4’x6’ flags and secure halyard.
   14 Provide flags.

C. Foundation Receiver:
   01 16-gauge (minimum) corrugated, galvanized receiver in full length of foundation footing as determined by flag manufacturer.
   02 Diameter: flag pole base diameter plus 2” nominal.
   03 Provide clean bank sand packed around flag pole set in corrugated receiver.

D. Flags:
   01 Size: nominal 4’ x 6’.
   02 Provide one (1) Texas state flag and one (1) US flag at each flag pole.
   03 Flags shall be 100% nylon, with double stitched seams and edges.
   04 Provide grommets for attachment to halyards, minimum two (2) per flag.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in location shown on the Drawing in strict accordance with manufacturer's instruction and approved Shop Drawing.

B. Provide positive lightning ground.

C. Check and adjust installation fittings for smooth operation before acceptance.

END OF SECTION

SECTION 11 31 00

RESIDENTIAL APPLIANCES

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CC AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: Provide all residential / commercial appliances indicated on the Drawings, including, but not limited to:
   01 Refrigerators / Freezers

C. Related Work:
   01 Section 11 40 00 – Food Service Equipment
   02 Division 22 – Plumbing
   03 Division 26 – Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   04 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   05 Generic details that do not depict actual conditions shall not be acceptable.

D. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   06 Include recommended cleaning products and instructions for use.
   07 Where applicable, provide recommended maintenance schedules and procedures.

E. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   08 Show profiles, sizes, spacing and locations of assembly components.
   09 Show details of shop fabrications, connections and details.
   10 Show details of field fabrications, connections and details.
   11 Provide calculations demonstrating compliance with wind load and other requirements.
   12 Shop Drawings shall be sealed and signed by a Texas Registered Engineer.

F. If products are provided by an acceptable manufacturer not used in the basis-of-design, provide Shop Drawings indicating revisions required to adjacent or interfacing assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of residential appliances is based on products manufactured by GE; unless otherwise indicated in the appliance descriptions below.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide residential appliance products of this Section, provide all proposed products meet or exceed the specified requirements.

01 Electrolux
02 Kenmore
03 LG
04 Maytag
05 Uline
06 Whirlpool

C. All appliances shall meet the requirements of Americans with Disability Act (ADA) and Texas Accessibility Standards (TAS).

2.2 RESIDENTIAL APPLIANCES

A. Refrigerator / Freezer

13 Manufacturer: GE Refrigerator / Freezer
14 Model No.: GIE22JSNR, Energy Star 21.7 CF refrigerator / freezer (on top) with ice maker.
15 Dimensions: 32-7/8”W x 66-3/4”H x 34”D
16 Color: Stainless Steel (SS).

B. Under counter Refrigerator:

17 Manufacturer: GE “Compact” Refrigerator.
18 Model No.: GME04GLKLB, 4.3 CF Compact Refrigerator
19 Suitable for mounting below a 1-1/4” thick, 34” high countertop
20 Dimensions: 20-1/2”W x 32-3/4”H x 21”D
21 Color: Clean Steel.

D. Washer:

01 Manufacturer: Whirlpool.
02 Model No.: WTW4850HW 28”
03 Top Load
04 Color: White.

E. Dryer:

01 Manufacturer: Whirlpool.
02 Model No.: WED4850HW 29” Electric
03 Front Load
04 Color: White.

PART 3 - EXECUTION

3.1 COORDINATION AND PREPARATION

A. Where appliances are shown to be built in to casework and other assemblies, coordinate with other trades as required to provide proper clearances and installation of appliances.

B. Coordinate with electrical, mechanical and plumbing trades as required for proper connection and interface with appliances.

3.2 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Adjust for proper operation.

END OF SECTION

SECTION 11 4000

FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.2 WORK

A. Include the work specified, shown or reasonably inferable as part of Foodservice Equipment.

1.3 RELATED WORK IN OTHER SECTIONS

A. Slab depressions, reinforced concrete wearing bed and interior finished floor at Walk In Refrigerator/Freezer.

B. Concrete or masonry platforms with coved base at perimeter, for equipment.

C. Slab depressions for stainless steel drain trench liner/grate assemblies.

D. Corner guards.

E. Supply and exhaust fans for foodservice exhaust/supply hoods.

F. Roughing in and final connection of mechanical, electrical, and plumbing except indirect wastes built in to fabricated equipment.

1.4 QUALITY ASSURANCE

A. In addition to complying with applicable laws, statues, building codes and regulations of public authorities, comply with the following:
   01 National Sanitation Foundation (to bear label)
   02 National Electric Code
   03 Underwriters' Laboratories, Inc.
   04 Edison Testing Laboratories
   05 American Gas Association Laboratories
   06 National Fire Protection Association
   07 American Disabilities Act

1.5 SUBSTITUTIONS

A. Equipment items or components specified are intended to be the Basis of Bid. All other brands, including additional names listed as "Approved Equal" must conform with the specifications, size, accessories, etc. of the first- named brand and be subject to Paragraph C-03 of this Article.

B. Proposed Substitutions:
   01 Submitted no less than 14 calendar days prior to Bid Date.
   02 Submit with catalog data and/or manufacturer's shop details indicating all

modifications required to conform with specified brand.

C. Substitutions with Prior Approval:
   01 Submitted on Bidder's letterhead attached to Proposal Form with each additive/deductive amount stipulated.
   02 Owner reserves the right to accept or reject any or all substitution proposals before execution of contract.
   03 Provide all engineering services required to make adjustments in space, utilities, etc. and pay all additional costs of utilities or construction that may occur due to the requirements of the accepted substitutions.

1.6 REUSED EXISTING EQUIPMENT

A. Utility disconnection and reconnection under Division 22 and 26.

B. Removal, transportation and replacement: Under this Section and scheduled with General Contractor.

C. Thoroughly clean inside and out, prior to relocation.

D. Review functional parts (doors, controls, heating elements, compressors.)

E. Existing equipment not scheduled for reuse is to be carefully removed.

1.7 WARRANTY

A. Provide a written warranty for a period of one year from the date of Substantial Completion, including extended four year replacement warranty on compressor bodies.

B. Components of equipment subject to replacement prior to one-year's use (such as steam cooker door gaskets) and those items which may fail due to improper or inadequate maintenance by the Owner/Operator (such as an uncleaned refrigeration system condenser) are not intended to be included within the scope of the Warranty.

C. Refrigeration systems/equipment: One year free service available within twenty-four hours of notification.

1.8 INSTRUCTIONS TO BIDDERS

A. During Bidding: Contractor's or vendor's questions and comments pertaining to document clarity or intent will be responded to with addendum.

1.9 SUBMITTAL DATA

A. Special Requirements: The following are in addition to any general requirements given elsewhere in the Documents.

B. Procedures: Submit to the consultant (through the Architect) for preliminary review, one (1) electronic copy and/or at least two (2) prints/hardcopies, within four weeks after award of contract. Upon return of one (1) copy of data, submit the required number of copies to the Architect for processing. Partial submittals will not be accepted or processed.

C. Brochure:
   01 Front and rear covers with labeled project name.

02 A separate flysheet for each component or item of equipment, indicating: item number, name, quantity, manufacturer, optional equipment, modifications, and utility requirements. An item of equipment or assembly containing more than one buy out sub-assembly or component shall have the secondary item listed in parenthesis beside the primary item name, i.e, Dishtable (Disposer).

03 Catalog specification sheet and/or manufacturer's drawing.

D. Plan and Rough in Drawings:

01 1/4" scale drawing of fixed/non fixed Foodservice Equipment with itemized schedules.

02 Separate drawing sheets of same size as contract drawings (Contract Drawings are not to be traced or reproduced).

03 Electrical roughing in drawing.

04 Plumbing/mechanical rough in drawing.

05 Critical dimension drawings, sizing and locating the following conditions:

a. Slab depressions or block outs.

b. Concrete or masonry platforms.

c. Pipe sleeves or roof jacks.

06 Required information:

a. All fixed and movable Foodservice Equipment shown on Contract Drawings.

b. All general use and convenience utilities or services indicated, including those required or connected to equipment or devices not in this Section.

c. All roughing in drawings fully dimensioned from finished room surface and/or established column lines to point of stub up through floor and stub out through wall or ceiling for all mechanical, electrical and plumbing services.

E. Shop Drawings:

01 Sheet Size: Identical to Contract Drawings drawn at 3/4" scale for plan view and elevations, and 1-1/2" scale for sections and construction details.

02 Included information: Item Number, name and quantity

03 Construction details, sections and elevations to reflect requirements of the specifications and drawings.

04 Adjacent walls, columns and equipment.

05 Plumbing and electrical schematic drawings for equipment such as; conveyors, self-cleaning exhaust hood, exhaust hood fire protection systems, and fabricated fixtures with single electrical and/or plumbing connection.

1.10 OPERATIONS & MAINTENANCE MANUAL

A. Three copies bound in 1-1/2" hardback, three ring binders (as many volumes as required by scope of project) with same data as brochure at completion of installation.

B. Catalog specification sheet and/or manufacturer's shop drawings.

C. Manufacturer's operating/maintenance data including replacement parts information and price list. Provide the name, title and address of personnel at each respective manufacturer to be contacted for spare of replacement parts after guarantee period.

D. Furnish a list of all equipment and their respective local service agencies, indicating the address, telephone number and name of person to contact. Whenever possible, the service agencies selected shall be factory authorized for the equipment assigned.

1.11 VERIFICATION AND COORDINATION OF PROJECT/DATA

A. Refrigerated and Dry Storage Areas: Verify and coordinate dimensions to accommodate modular shelf sections. Notify Architect of variance between the Contract Documents and actual conditions.

B. Rough-In Drawings: Review for accuracy and completeness and notify Architect of deficiencies. Field-check locations. Cooperate and coordinate work with other sub-contractors.

C. Dimension Responsibility: Obtain actual or guaranteed measurements for proper fit of equipment. All dimensions given are approximate and are as accurate as can be determined at this time. Field check all measurements and conditions at the building prior to fabrication or delivery of equipment and notify the Consultant of any deviation from the dimensions shown.

D. Scheduling to Fit Openings: Should it become necessary to schedule construction of walls or partitions prior to delivery of fixed equipment, the equipment must be fabricated for passage through finished openings. Maintain close contact with the project and be cognizant of all conditions.

E. Existing Equipment: Foodservice Contractor is responsible for verifying mechanical, electrical and plumbing characteristic of any existing equipment scheduled for re-use prior to submitting rough-in drawings. Foodservice Contractor to perform all tasks required to integrate/complete any new items with existing equipment and field conditions.

PART 2 - PRODUCTS

2.1 MATERIAL/COMPONENTS

A. Stainless steel sheets and/or shapes: 18-8, Type 304, polished to 180 grit No. 3 finish.
   01 Stainless steel joints and seams: heli-arc welded, free of pits and flaws, ground smooth and polished to No. 4 finish.
   02 The "grain" direction of horizontal stainless steel surfaces: longitudinal, including the back splash. The polishing procedure at right angle corners of fixtures shall provide a mitered appearance.

B. Galvanized Iron Sheets: Armco copper bearing Zinc Grip or Zinc Grip/ Paint Grip.
   01 Galvanized iron joint and seams: arc welded, free of pits and flaws and ground smooth.
   02 Galvanized sheets and/or shapes: washed with mineral spirits and primed with Rustoleum enamel in color selected by Architect.

C. Sound Deadening: Schnee Butyl Sealant 1/2" wide rope positioned continuously between all frame members and underside of stainless steel tabletops, overshelves and undershelves. Tighten stud bolts for maximum compression of sealant.

D. Plastic Laminates/Corian: color/pattern selected by Architect, in 1/16" thickness for flat surfaces; 1/32" thickness for radiused surfaces. Plastic laminates and adhesives must be approved by N.S.F. (Standard No. 35).

E. Identification Plates, Labels, Tags:
   01 Prohibited Information: Names of suppliers, fabricators and contractors.
   02 Required Information: function or purpose of such things as display light switches, food warmer controls, etc.

F. Plate Construction: engraved phenolic plastic, secure to equipment with epoxy cement or stainless steel screws. Furnish samples.

2.2 PLUMBING/MECHANICAL REQUIREMENTS

A. Plumbing fittings and components: furnished under this Section as follows. Components which are provided loose under this Section for field installation and connection by Division 22 are indicated by asterisk* or as indicated on details.

01* Control valves, water pressure regulators, vacuum breakers and chrome plated 90º elbows and nipples (no copper piping above splash) wherever required on Foodservice Equipment.

02* Faucets and drain fittings with connected overflows for all sinks.

03* Specialty Foodservice water fill faucets or hose assemblies indicated in drawings/specifications.

04* Wade No. W-10 Shock Stop shock absorbers for all Foodservice Equipment with quick opening or solenoid operated water valves.

05 Extensions of indirect waste originating with-in fabricated counters and/or equipment to open site drains. Drains: 1" minimum, Type "K" copper. All material and labor for final connection from equipment/sink tail pieces and anklets to open-sight drain over building floor sink or drain by Division 22.

06 All drainlines furnished with equipment: 1" thick insulation.

07 Piping brackets and/or supports beneath/within fabricated equipment.

B. Final Plumbing Connections Provisions:

01 Fabricated equipment containing components, fittings and/or devices indicated on Foodservice Connections Drawings to be connected to the building systems shall have each component, fitting or group thereof prepiped to a utility compartment for final connection by Division 22. Refer to drawings for capacities.

02 Division 22 to supply all required piping/nipples, etc. to make complete installation. All gas lines connected to equipment with flexible hoses with quick connection action. (Quick-connects and steel reinforced supply hoses, by K.E.C.) Installed by Division 22.

03 Field assembled equipment (i.e., conveyor systems, exhaust hoods, conveyor type dishware machines, convection ovens, etc.) shall have plumbing components completely interconnected under this Section for final connection by Division 22 in arrangements indicated on Utility Connection Drawings by Division 22.

04 Back flow preventers, when required by local code, to be provided by Division 22.

C. Ducts and Vents:

01 Exhaust hoods, which are furred in to ceiling: 2" high duct collar for final connection to duct system.

02 Dishwash machine equipped with integral vent cowls or extended hoods: furnished with 18 gauge stainless steel seamless duct risers to 6" above finish ceiling for final connection. The duct: trimmed at ceiling with 16-gauge stainless steel angle flange with all corners welded.

2.3 FOODSERVICE EQUIPMENT REFRIGERATION SYSTEMS

A. Install complete with all refrigerant, oil, dials, dehydrators, gauges, controls as required for the proper operation of the system.

B. Self-contained or factory installed compressors: check and adjust to proper operating temperature.

C. Refrigeration Components:

01 Unit coolers: specified quantity and model, ceiling hung by 1/2" o.d. nylon bolts with stainless steel washers and nuts. Insert hanger bolts through plastic sleeve and seal penetration airtight.

a. Unit cooler drain fittings: positioned as indicated on drawings. Install cast

tee fitting on drain-pan outlet with union, clean out plug and extend 1" copper drain-line through wall panel to air gap fitting or floor drain.

b. Slope drain-line 1/2" per foot, trap at exterior of assembly and turn down into drain. Manifold drainlines of adjacent compartments wherever possible.

c. Install plastic sleeve through compartment wall, seal around drain-line and install stainless steel escutcheon with setscrew.

d. Heat exchanger: on all unit coolers; in proper size.

e. Electric drain-line heater cable: on all unit coolers operating below 36 degrees F, installed from drain-line fitting to wall penetration. Heater cables: minimum rating of 30 watts/ lineal foot, 120 volt. Wrap drain-line with maximum spacing of 2" loop spacing. Interwire to unit cooler for continuous operation.

D. Refrigerant System Installation:

01 Refrigerant lines: Type "L" hard copper tubing. Fittings: wrought copper or brass designed for use with high temperature solder. Piping joints: made with silver solder (Sil-Fos). Piping: properly suspended from and anchored to the structure with adjustable hangers 6' o.c. maximum. Suction lines: sized to have maximum pressure drop of two pounds in medium temperature systems; one pound in low temperature systems. Liquid lines: sized to give maximum pressure to prevent trapping of oil. Rigid insulation: 1" thick Armstrong Accotherm (1-1/2" thick at low-temp) with factory applied fire retardant jacket and vapor barrier on all suction lines.

02 Cover exterior refrigeration lines with aluminum jacketing. Seal any openings where lines pass thru exterior walls with expanding foam. Paint silver to match aluminum jacketing.

E. Evacuation and Charging:

01 After completion of the pressure test, the system shall be evacuated using an approved auxiliary vacuum pump. Connections for evacuation in accordance with manufacturer's recommendations.

02 Charging subsequent to the initial charge, which is contained in the condensing unit: given through the charging valve in the high side passing all the liquid refrigerant through a charging dehydrator. All charging lines and gauges: purged of air prior to connection with system. After the system is fully charged: started and placed in full operation.

F. Refrigerant Leak Detection Systems

01 In the City of Houston and any other jurisdiction with similar requirements, when the quantity of refrigerant in the system dictates the necessity for a refrigerant leak detection system, this system shall become the responsibility of the foodservice contractor.

2.4 ELECTRICAL REQUIREMENTS

A. Electrical fittings and components: furnished under this Section as follows. Components provided loose under this Section for field installation and connection under Division 26 are indicated with, by asterisk * or as indicated on detail. Coordinate foodservice equipment voltage and phase with building system.

01* Ceiling lights, pre-wired with pigtails and mounting hardware consisting of F.S. J/box with cover and G.I. or plastic nipple to fasten to walk-in box ceiling panels. K.E.C. to provide all lights and drill holes in walk-in boxes ceiling, Division 26 will install lights and loop wire to electrical roughing-in J/box above walk-in boxes door panel and seal all holes in panels. All wiring to be above ceiling panels in code acceptable conduits.

02 Division 26 to connect all control wiring for walk-in box evaporators from remote

compressor panel to walk-in box evaporators and provide disconnect switch on evaporator, all wiring rigid metal conduit, to code requirements. K.E.C. to supply remote outdoor refrigeration racks, pre-wired to master control panel. Division 26 to connect power lines from roughing-in points to master control panel.

B. Cord and caps:
   01 Coordinate all Foodservice Equipment cord/caps with related receptacles.
   02 All 120 volts "plug in" equipment shall have Type SO or SJO cord and plug with ground wire fastened to frame/body of item.
   03 Cord lengths for fixed equipment: adjusted to eliminate loose-hanging excess.
   04 All non-fixed plug in "buy-out" equipment shall have Hubbell configuration, ratings as required.

C. Switches and Controls:
   01 Each motor driven appliance or electrically heated unit: equipped with control switch or starter as per Underwriters' Laboratories, Inc. with low voltage and overload protection.

D. Motors:
   01 120-volt motors; manual tumbler type starter with thermal overload protection and interchangeable heating elements.
   02 208 volt and 480 volt motors; magnetic starter with low voltage protection and one interchangeable overload relay per phase.

E. Receptacles and Switches:
   01 Receptacles installed in/on-fabricated equipment: Hubbell, Inc. assemblies mounted in a metal box with stainless steel cover plate.
   02 Load centers installed in/on fabricated equipment to have all fixture components pre-wired to load center with balanced phase loading. Load center ready for final connection by Division 26.

F. Final Electrical Connection Provisions:
   01 Fabricated equipment containing electrically operated components and/or fittings indicated on Utility Connections Drawings to be direct connected, shall have each component, fitting or group thereof pre-wired to a junction box for final connection by Division 26. Refer to drawings for circuit loading.
   02 Fabricated equipment containing electrically operated components and/or devices indicated to have a circuit breaker load center shall have each component or device pre-wired to a separate circuit breaker for balanced phase loading and single final connection by Division 26.
   03 Field assembled equipment (i.e., prefabricated walk in refrigerator/freezers, exhaust hoods), shall have electrical components completely interconnected in this Section for final connection arrangements as indicated on Utility Connection Drawing.

2.5 CUSTOM FABRICATED/ASSEMBLED UNITS

All fixtures within this Section are to be constructed by one manufacturer, of uniform design and finish.

A. Counter/Tabletops:
   01 14-gauge stainless steel; all free edges turned down 180° on 1 5/8" radius. Free corners: rounded on 3/4" radius.
   02 Marine edges: turned up 1/2" on 45° angle and turned down 2" with 3/4" tight hem at bottom.
   03 Tops abutting high fixtures or walls: cove up 6" and slope back 1-1/2" at top on

45°angle; 2-1/2" where piping occurs. Turndown 1" at rear of splash and close ends to bottom of top turndown. Secure splash turndown to wall with 4" long 14 gauge Stainless Steel "zee" clip anchored to wall, 36" o.c.

04 Freestanding tables and all serving counter splash risers: turned back on 90° angles with 1" turndown at rear.

05 Brace tops with rigid-welded 1-1/2" x 1-1/2" x 1/8" galvanized steel angle frame at perimeter with cross bracing 2'-0" o.c. maximum. Provide 4" x 4" x 12 gauge steel triangular pads where leg socket welds to gusset. Paint entire frame with Rustoleum Primer. Angle frames: secured to underside of top surfaces with 1/4" studs welded 9" o.c. maximum with chrome-plated washer, lock washer, and cap nut. Studs: such length that cap nuts can be made-up tight, bringing top down snugly on an angle frame eliminating all vibrations or "oil-cannings."

06 All tops: 1-1/2" overhang at free sides of underframe or Closed Base Body.

07 All openings in tops shall have raised die formed edges, 3/16" high.

08 Reinforce all "built-in" counter equipment with framing members at perimeter of opening.

B. Food Wells:

01 Food warmer controls: remote mounted in sloping recessed apron panel. Control panel is recessed with 2-1/2" from bodyline at top of 60° slope, 1" at lower edge. Terminate slope angle 2-1/2" below under counter top.

02 Manifold all warmer drains and extend to within utility compartment for indirect waste connection. Install valve in drain-line and extend handle through compartment door. Provide individual P.O. plugs for each warmer.

C. Sinks:

01 14-gauge stainless steel, all corners coved on 3/4" radius. Provide 1-1/2" wide double walled partitions with flat tops between compartments.

02 Exposed exterior panels of multiple compartment sinks are to be continuous. All gaps between compartments must have 14-gauge stainless steel filler panel welded, ground and polished.

03 Score and slope sink bottom 1/2" to drain. Set overflow centerline 1" below drainboard.

04 Fabricator may use at his option die stamped sink inserts of size and gauge specified.

D. Warewash Assembly:

01 Dishtable:

a. 14 gauge stainless steel; all free edges coved up 3" with 1-1/2" diameter rolled rim and bullnosed corners.
Two full length 1/8" high die-formed inverted "vee" ridges 10" o.c. at longitudinal centerline of top, with tapered ridge ends.

b. Edge of dishtables next to high fixtures or walls: coved up 10" and sloped back 1-1/2" on 45 degree angle; 2-1/2" where piping occurs. Turn down 1" at rear of splash and close ends to bottom of rolled rim. Secure splash turndown to wall with 4" long 14 gauge stainless steel "zee" clips anchored to wall, 36" o.c.

c. Slope tables 1/8" per foot, maintaining level crown and cove all corners on 3/4" radius.

d. Brace dishtables with 1" x 4" x 12 gauge stainless steel channels down centerline of top and between each pair of legs, with closed ends. Bracing: secured to underside of dishtable with 1/4" studs welded 6" o.c. maximum, with chrome plated washer, lock washer and cap nut. Studs: such length that the cap nuts can be made up tight, bringing the dishtable down in the channel members, eliminating all vibration and "oil-cannings."

E. Closed Base Bodies:
   01 Frame: rigid welded 1-1/2" x 1-1/2" x 1/8" galvanized steel angle forming a continuous structure around the top and bottom perimeters of the fixture, a post at each corner, studs spaced 48" o.c. maximum and shelf stringers. Top of frame is cross braced with 1-1/2" angles, 2'-0" o.c. maximum.
   02 Panel and trim with 18-gauge stainless steel, having concealed attachment with all seams being welded, ground and polished.
   03 Exposed vertical corners rounded on 3/4" radius. Closed Base Bodies adjacent to walls or fixtures have square corners.
   04 Close and seal vertical and horizontal channel at shelf interiors or drawer enclosures, such as corners and center mullions.
   05 Closed Base Bodies set on masonry platforms: closed and caulked at underside of equipment overhang and bolted to platform. Bodies overhang platform 1" at free ends; 2" at front and exposed rear sides.

F. Utility Compartments:
   01 Closed Base bodies: fitted with utility compartments wherever piping or wiring is required in/on the fixture.
   02 Same material as Closed Base bodies with back and end partitions. Omit bottoms only.
   03 Access doors: 18 gauge stainless steel double pan type with channel formed horizontal recessed pull full length of top (similar profile to Garcy No. R-1060) with closed ends. Offset the lower horizontal framing member of the Closed Base fixture to permit flush alignment of door with face and bottom edge of body. Door hardware: two Component Hardware No. M74-3078 stainless steel hinges and one Component Hardware No. M27-2470 catch. The recess on plumbing compartment door is to be constructed using an APW stainless steel bowl with the bottom removed to allow the handle to be accessible.
   04 No shelves of Closed Base fixtures are to be penetrated.

G. Serving Counters:
   01 Exterior body panels: 3/4" thick hardwood plywood with plastic laminate in Architect's selection of color/pattern at all exposed surfaces; backing sheet where concealed.
   02 Position and finish horizontal and/or vertical reveal as directed by Architect.
   03 Secure laminated panels to counter body framing in concealed manner. Install removable panels with "zee" clips overlapping body-framing members.
   04 Rear side and interior of serving counters: closed base bodies. Vertical juncture of plastic laminate and stainless steel at rear corners of body: a 1/2" wrap around of stainless steel for flush joint with plastic laminate.

H. Open Base Structures:
   01 1-5/8" o.d. x 16 gauge seamless stainless steel tubing legs beveled at bottom. Fully weld 1-1/4" o.d. crossrails to legs.
   02 Top of leg: inserted in Component Hardware No. A20-0206 socket fully welded to table frame or sink bottom gusset.
   03 Round foot: Component Hardware No. A10-0852.
   04 Table bases: maximum leg spacing of 5'-0" o.c.; dishtable and utensil wash counter bases at 5'-0" o.c.

I. Overshelves:
   01 16 gauge stainless steel with free edges turned down 1" with 1/2" tight hem at bottom. ¾" radius at free corners.
   02 Turn up 2" raw at walls or adjoining high fixtures with horizontal coved corner at rear. Round front corners of turnup on 3/4" radius.

03 Where shelf width exceeds 12" width, reinforce with 1/2" x 4" x 14 gauge stainless steel closed hat channel full length of shelf.

04 Wall mounted shelves: Keil Model No. 1508-1010-1251 or equal brackets 48" o.c. maximum set in 6" from ends. Coordinate wall backing with General Contractor at gypsum board walls or as required.

05 Freestanding shelves: Where turnup is required at free overshelves, the shelf is to be turned up 2" at ends, coved up at rear and hemmed tight to bottom of front turndown. Weld exposed corners.

06 Freestanding overshelves: Keil or equal cantilevered brackets at rear of table; Keil double cantilevered brackets at center of table. Posts for cantilevered overshelves are 1-5/8" o.d. x 16 gauge stainless steel secured to underframe, 4'-0" o.c. to underframe, 4'-0" o.c. Ends of shelves: Secured to adjacent wall/fixture or mounted on 1-1/4" diameter stainless steel posts.

07 Freestanding overshelves not on cantilevered brackets: 1-1/4" o.d. x 16 gauge stainless steel posts, each pair at 4'-0" o.c., maximum.

J Undershelves:

01 Open Base Structures: 16-gauge stainless steel turned down 1-1/2" tight hem at bottom. Notch all corners to fit tubular legs and weld from underside to completely fill gap; grind and polish. Cove up 2" at rear and/or ends adjacent to wall, columns, refrigerators, etc. The turnup is to be hemmed tight to bottom of turndown when turnup is specified for freestanding fixtures. Brace undershelf with 1" x 4" x 14 gauge stainless steel channel at longitudinal centerline and at each intermediate pair of legs.

02 Closed Base Fixtures: 16 gauge stainless steel turned down 1-1/2" at front. Front edge of bottom shelf: turned back and sealed to masonry platform or boxed for leg application. Center shelf has 3/4" tight hem.

a. Shelves: turn up square at ends (coved up at rear only) to the shelf above or counter top flanged out for attachment with no open spaces at interior.

b. All shelf partitions at exposed ends of cabinet bodies or interiors: free of exposed framing members.

c. Reinforce shelves with full-length 1" x 4" x 14 gauge stainless steel closed hat channel.

d. Unless otherwise noted, all undershelves are to be 22" deep, clear.

e. Weld the vertical seam of shelf turndown/turnup with face of body partition.

K. Shop/Field Joints:

01 Stainless steel tops: welded, ground and polished to No. 4 finish.

PART 3 - EXECUTION

3.1 DELIVERY AND INSTALLATION

A. Supervision: Provide a competent foreman or supervisor who shall remain on the job during the entire installation.

B. Delivery: Foodservice Equipment excluding exhaust hoods, trench liners and walk-in coolers/freezers are <u>not</u> to be delivered and/or set in place until the following construction has been completed: kitchen floors prepped and cleaned, walls painted, ceiling installed and wiring pulled to junction boxes. (note 1. acid floor washes are not to be used on or near stainless or aluminum surfaces. 2. Walk-in doors are to remain open during concrete cure).

01 Assemble, square, level and make ready items for the final utilities connections.

02 Scribing: cut neatly around obstructions to provide sanitary conditions.

03 Where gaps occur between equipment, apply General Electric silicone

construction sealant Series SE-1200 mastic or stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement and/or "zee" clips wherever possible to secure trim.

3.2 CLEAN AND ADJUST

A. Clean up and remove from the job site, all debris resulting from the work as the installation progresses.

B. Thoroughly clean and polish all Foodservice Equipment, in and out, ready for Owner's use prior to demonstration and final inspection.

C. Lubricate and adjust drawer slides, hinges, casters.

D. Clean and replace faucet aerators, water strainers.

E. Touch up damage to painted finishes.

F. Start up and check all refrigeration systems for at least 72 hours prior to acceptance.

3.3 EQUIPMENT START-UP/DEMONSTRATION

A. Carefully test, adjust and regulate all equipment in accordance with the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments and performance are in full compliance.

B. Provide the Owner and/or Operators with a thorough operational demonstration of all equipment and furnish instructions for general and specific care and maintenance.

3.4 FINAL INSPECTION

A. Final inspection will be made when the contractor will certify that he has completed his work; made a thorough review of the installation/operation of each item in the contract and found it to be in compliance with the construction documents.

B. The Foodservice Consultant's repetitive final inspection and all costs associated thereto, incurred due to the Contractor's failure to comply with the requirements of this Article, will be invoiced to this Contractor.

4.0 EQUIPMENT SCHEDULE

A. Provide regularly manufactured equipment components included in this Section with standard finishes and accessories unless specifically deleted or superseded by the Contract Documents.

Item No. 01 – Walk-In Cooler/Freezer **Quantity One (1) Lot**

A. One (1) Thermalrite two (2) compartment assembly. Assembly panels to be the nearest nominal size to attain a height of 8’-6” to 8'-8" from top of exterior walk in panels to finished floor. Set in floor recess per Detail.
   01. 20-gauge stainless steel exterior where exposed, white galvalume interior. Galvalume exterior finish where not exposed.
   02. Self-closing doors with heated view windows.
   03. Full perimeter high wattage door heaters.
   04. Heated thresholds.
   05. Heated pressure relief port at freezer.

06. Dial type thermometer.
07. Foot treadle.
08. Matching closure panels to finished ceiling.
09. Stainless steel trim strips at gaps between building walls and walk-in assembly.
10. Provide one (1) Kason Model No. 1806LED000, LED light fixture and optic globe above each door at the interior of the walk-in.
11. Four (4) Kason Model No. 1810LX4000, LED light fixtures with lamps. Pre-wire fixtures to J-Box mounted above each compartment no exposed conduit inside walk-in.
12. 36" high 18 gauge stainless steel kick plate at interior and exterior of doors.
13. Provide wall mounted door bumpers on walk-in exterior.
14. Provide two-piece strip curtain swinging doors with mounting hardware at cooler and freezer.
15. Stainless steel wall bumper full length of walk-in exterior wall, where exposed. Mount at 30" A.F.F.

B. Approved Alternate Manufacturers: Kolpak, or American Panel.

Item No. 02 – Refrigeration System **Quantity One (1)**

A. One (1) ColdZone Model No. ET-1, outdoor air-cooled refrigeration rack. System to have the following units:

Refrigerator

01. One (1) Model No. ZS13KAE, 1.8 h.p., 208 volt, three-phase, condensing unit.
02. One (1) Model No. CL6A117ADARE, 115 volt, single-phase evaporator coil.
03. Refrigerant R-448A.
04. Adjust thermostat to 35ºF.

Freezer

01. One (1) Model No. ZF18K4E, 6.0 h.p., 460 volt, three-phase condensing unit.
02. Two (2) Model No. CL6E142DDARE, 208 volt, single phase evaporator coil.
03. Refrigerant R-448A.
04. Adjust thermostat to -10ºF.

B. All drain lines and refrigeration line welds/ connections must be soldered with 15% silver solder per PISD standards.

C. Run drain lines the shortest distance out of the walk-in cooler/freezer assembly. Run drain lines in the air space between building wall and walk-in cooler/freezer wall panels. Do not run drain lines inside of walk-in's cooler/freezer assemblies.

D. Provide refrigeration rack with coated condensers for protection against salt air environment, crankcase heaters and head master control on medium temp system.

E. Mount refrigeration rack on a galvanized angle iron stand anchored to a concrete pad.

Item No. 03 – Cooler/Freezer Shelving **Quantity One (1) Lot**

A. Cambro Shelving, four (4) tiers high, each section with four posts. Sections as follows:

Refrigerator

01. Two (2) CPU243664V4480 Camshelving® Stationary Unit 4 Shelves 24X36X64.
02. Eight (8) CPU244864V4480 Camshelving® Stationary Unit 4 Shelves 24X48X64.

Freezer

01. Two (2) CPU244264V4480 Camshelving® Stationary Unit 4 Shelves 24X42X64.

02. Two (2) CPU244264V4480 Camshelving® Stationary Unit 4 Shelves 24X42X64.
03. Eight (8) CPU244864V4480 Camshelving® Stationary Unit 4 Shelves 24X48X64.

Item No. 04 – Milk Dolly **Quantity Two (2)**

A. Two (2) Cambro Model No. CD1327, milk dollies.

Item No. 05 – Dry Storage Shelving **Quantity One (1) Lot**

A. Cambro Shelving, five (5) tiers high, each section with four posts.
01. Five (5) CPU244272V5480 Camshelving® Starter Unit 5 Shelves 24X42X72.
02. Six (6) CPU244872V5480 Camshelving® Starter Unit 5 Shelves 24X48X72.

B. Three (3) DRS480480, vented dunnage racks.

Item No. 06 – Can Rack **Quantity One (1)**

A. One (1) New Age Model No. 1250, can rack.

Item No. 07 – Three-Compartment Sink **Quantity One (1)**

A. One (1) three compartment sink assembly; size and shape as indicated on drawings.

B. 1-1/2" rolled rim at front and ends; 10" high splash where adjacent to wall.

C. Three (3) 24” x 26” x 15" deep sink compartments.

D. Three (3) Component Hardware Model No. D53-7215, rotary drains with connected overflows and tailpiece.

E. Two (2) T & S Model No. B-0290, splash mount faucets. Provide with Model No. B-0230KIT, installation kit.

F. Open base construction.

G. Undershelf below drainboards.

H. One (1) full-length wall mounted louvered overshelf.

Item No. 08 – Utensil Rack **Quantity Two (2)**

A. Two (2) Cambro Model No. CSUR44486, utensil rack.

Item No. 09 – Preparation Sink **Quantity One (1)**

A. One (1) preparation sink assembly; size and shape as indicated on drawings.

B. ½” marine edge at front; 10" high splash at wall.

C. Two (2) 24”" x 26" x 15" deep sink compartments. Weld ¼” stainless steel rods into sink corners for sink cover holders.

D. Two (2) Read Products “Richlite” ½” thick removable sink covers at each sink. 14 gauge stainless steel vertical sink cover rack mounted per drawings; refer to Details 1 & 2, Sheet

FS-7.

E. Two (2) Component Hardware Model No. D53-7215, rotary waste drains with connected overflows and tailpiece.

F. One (1) T & S Model No. B-0231, splash mount faucet.

G. One (1) T & S Model No. B-0163, pre-rinse with Model No. B-0107-C, spray valve unit with low flow spray head with B-0109, wall bracket and two (2) Model No. BCVV ½" check valves.

H. One (1) T & S Model No. B-0669-POL, hose bibb faucet. Garden hose provided by owner. Mount on 14-gauge stainless steel bracket; refer to details for construction.

I. Open base construction.

J. Provide undershelf below drainboard.

K. Install disposer and control where indicated.

L. One (1) wall mounted overshelf, length as indicated.

Item No. 10 – Food Processor **Quantity One (1)**

A. One (1) Robot Coup Model No. SL50 ULTRA, food processor. Verify processing discs with owner prior to ordering.

Item No. 11 – Disposer **Quantity One (1)**

A. One (1) Salvajor Model No. 200-CA-18, disposer with 18" diameter cone assembly.
   01. One (1) Model No. ARSS-LD, control panel.
   02. One (1) Model No. 980105 stainless steel mounting bracket for control panel. Mount control panel and bracket where indicated on drawings.
   03. One (1) dejamming prong.

B. Mount in Item No. 09 - Preparation Sink.

Item No. 12 – Stainless Steel Wall Cap **Quantity Two (2)**

A. Two (2) 18-gauge stainless steel wall caps; size and shape to fit wall thickness and length.
   01. Turn down 2" at free sides; up 2" at wall chase. Radius corners, no sharp edges.

Item No. 13 – Exhaust Hood **Quantity One (1)**

A. One (1) Mod-U-Serve Air Systems Model No. W-cpb, 5'-0" deep exhaust hood. All welded 18-gauge stainless steel construction with insulated supply air plenum.
   01. Stainless steel baffle filters.
   02. One (1) 12" x 12"" recessed LED light fixtures with factory supplied lamps per fixture, to provide 50-foot candles on cooking surface.
   03. Provide Mod-u-Serve Model No. ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110º F.
   04. Suspend from structure above ceiling, trim to ceiling with stainless steel closure panels.

05. Exhaust hood components and accessories shall be UL rated. Exhaust hood shall be fabricated in accordance with NSF requirements.
06. Stainless steel where exposed.
07. Provide double layer fire blanket.
08. Clearance requirement: Where any exterior surface of the hood is installed less than 18" from a combustible surface or penetrates a lay-in tile ceiling, provide where required the U-shaped 3" high S/S air space and also provide, where required, a double layer of an approved Fire Barrier Duct Wrap in a manner as prescribed by the manufacturer.

B. Install at 6'-10" A.F.F.

C. 18 gauge insulated stainless steel wall panel, full height from bottom of hood to top of coved base. Top of panel to be secured under hood.

Item No. 14 – Fire Suppression System **Quantity One (1)**

A. One (1) Ansul Model No. R-102, automatic liquid chemical system with all components required by NFPA Pamphlet No. 96, installed in hood in accordance with manufacturer's recommendation. Provide duct and plenum protection to Item No. 13 - Exhaust Hood, and surface protection as required to cooking equipment below.

B. Remote manual release in path of egress from protected exhaust hood area. Provide trim ring around pull.

C. Locate top of chemical cylinders as indicated on the drawings at ceiling level and install piping to hoods in a totally concealed manner. Any exposed piping and fittings shall be chrome plated or sleeved with stainless steel tubing. Exposed pipe threads in/above food zone are not acceptable.

D. Mechanical gas shut-off valve (installed in line by plumber).

Item No. 15 – Tilting Braising Pan **Quantity One (1)**

A. One (1) Groen Model No. BPM-30E, tilt braising pan.
01. Pan carrier.
02. Bullet feet in front with rear flanged feet for bolting to floor with stainless steel fasteners.

Item No. 15.1 – Fill Faucet **Quantity One (1)**

A. One (1) T & S Model No. B-0610, wall mount fill faucet. Mounted on wall 44" A.F.F. with stainless steel bracket where indicated on drawings. Construct stainless steel wall bracket per Detail.

Item No. 16 – Trench Liner/Grate **Quantity One (1)**

A. One (1) trench liner/grate assembly; construct per Detail.

Item No. 17 – Two-Burner Range **Quantity One (1)**

A. One (1) Jade Model No. JTRH-2, two-burner range.
01. Natural gas.
02. Stainless steel front with door.
03. Pressure regulator with ¾" rear gas connection.
04. Cap and cover manifold connections.

05. One (1) T & S Model No. HG-4D-48SK, 48" long quick disconnect with swivels at each end with restraining device (installed in line by plumber).

Item No. 18 – Convection Steamer **Quantity Two (2)**

A. Two (2) Groen Model No. (2)GSSP-BL-5GS, double stacked convection steamers.
01. Natural gas.
02. Door hinged as indicated.
03. One (1) T & S Model No. HG-4C-48SK, 48" long quick disconnect with swivels at each end with restraining device (installed in line by plumber).
04. One (1) Everpure Insurice Twin i2000² EV9324-02 water filter system. Mount on wall adjacent to equipment.
05. Mount on casters with brakes.

Item No. 19 – Trench Liner/Grate **Quantity One (1)**

A. One (1) trench liner/grate assembly; construct per Detail.

Item No. 20 – Number Not Used

Item No. 21 – Worktable w/ Table Mounted Pot Rack **Quantity One (1)**

A. One (1) worktable assembly w/table mounted pot rack; size and shape as indicated on drawings.

B. Turn free sides down 2" square; 3/4" radius corners.

C. Two (2) drawer assemblies.

D. One (1) full length table mounted pot rack with overshelf assembly. Extend post through top of worktable; construct per Details. Provide stainless steel pot hooks 8" o.c.

E. Open base construction.

F. Full length undershelf.

Item No. 22 – Worktable w/ Table Mounted Pot Rack **Quantity One (1)**

A. One (1) worktable assembly w/table mounted pot rack; size and shape as indicated on drawings.

B. Turn free sides down 2" square; 3/4" radius corners.

C. Two (2) drawer assemblies.

D. One (1) full length table mounted pot rack with overshelf assembly. Extend post through top of worktable; construct per Details. Provide stainless steel pot hooks 8" o.c.

E. Open base construction.

F. Full length undershelf.

Item No. 23 – 20 Quart Mixer w/Stand **Quantity One (1)**

A. One (1) Hobart Model No. HL200, 20-quart mixer with standard accessory package.
01. 20 Quart Bowl Scraper

02. 20 Quart Ingredient Chute
03. Stainless steel 12 quart bowl, beater, whip and adaptor.
04. 9" vegetable slicer with slicer plate, grater and shredder.
05. Protective rubber feet.

B. One (1) Caddy Model No. T-242, mixer stand or fabricated equal. Secure mixer to stand.

Item No. 24 – Exhaust Hood **Quantity One (1)**

A. One (1) Mod-U-Serve Air Systems Model No. W-cpb, 5'-0" deep exhaust hood. All welded 18-gauge stainless steel construction with insulated supply air plenum.
01. Stainless steel baffle filters.
02. Three (3) 12” x 12”” recessed LED light fixtures with factory supplied lamps per fixture, to provide 50-foot candles on cooking surface.
03. Provide Mod-u-Serve Model No. ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110º F.
04. Suspend from structure above ceiling, trim to ceiling with stainless steel closure panels.
05. Exhaust hood components and accessories shall be UL rated. Exhaust hood shall be fabricated in accordance with NSF requirements.
06. Stainless steel where exposed.
07. Provide double layer fire blanket.
08. Clearance requirement: Where any exterior surface of the hood is installed less than 18” from a combustible surface or penetrates a lay-in tile ceiling, provide where required the U-shaped 3” high S/S air space and also provide, where required, a double layer of an approved Fire Barrier Duct Wrap in a manner as prescribed by the manufacturer.

B. Install at 6'-10" A.F.F.

C. 18 gauge insulated stainless steel wall panel, full height from bottom of hood to top of coved base. Top of panel to be secured under hood.

Item No. 25 – Combi Oven **Quantity One (1)**

A. Two (2) Rational Model No. ICP 6-FULL NG, stacked gas combi ovens.
01. Natural gas.
02. One (1) stacking kit.
03. Provide three (3) additional oven racks per oven.
04. One (1) Everpure Insurice Twin i2000² EV9324-02 water filter system. Mount on wall adjacent to equipment.
05. Provide separate gas connections for top and bottom units and two (2) T & S Model No. HG-4C-48SK, 48" long quick disconnects with swivels at each end with restraining device (installed in line by plumber).
06. Smoker accessories.
07. Cleaning tablets.
08. Mounted on mobile stacking base.

Item No. 26 – Convection Oven **Quantity Three (3)**

A. Three (3) Blodgett Model No. DFG100DBL, double deck convection ovens.
01. Natural gas.
02. Stainless steel front, top and sides.
03. Stainless steel perforated rear panel.

04. Door with dual pane windows.
05. Two (2) extra standard wire racks in each oven compartment.
06. Two speed motor.
07. Mount on 6” casters with brakes.
08. Provide separate gas connections for top and bottom units and two (2) T & S Model No. HG-4D-48SK, 48" long quick disconnects with swivels at each end with restraining device (installed in line by plumber).
09. Provide draft diverter.
10. Manual controls.

Item No. 27 – Exhaust Hood **Quantity One (1)**

A. One (1) Mod-U-Serve Air Systems Model No. W-cpb, 5'-0" deep exhaust hood. All welded 18-gauge stainless steel construction with insulated supply air plenum.
   01. Stainless steel baffle filters.
   02. Three (3) 12” x 12”” recessed LED light fixtures with factory supplied lamps per fixture, to provide 50-foot candles on cooking surface.
   03. Provide Mod-u-Serve Model No. ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110º F.
   04. Suspend from structure above ceiling, trim to ceiling with stainless steel closure panels.
   05. Exhaust hood components and accessories shall be UL rated. Exhaust hood shall be fabricated in accordance with NSF requirements.
   06. Stainless steel where exposed.
   07. Provide double layer fire blanket.
   08. Clearance requirement: Where any exterior surface of the hood is installed less than 18” from a combustible surface or penetrates a lay-in tile ceiling, provide where required the U-shaped 3” high S/S air space and also provide, where required, a double layer of an approved Fire Barrier Duct Wrap in a manner as prescribed by the manufacturer.

B. Install at 6'-10" A.F.F.

C. 18 gauge insulated stainless steel wall panel, full height from bottom of hood to top of coved base. Top of panel to be secured under hood.

Item No. 28 – Fire Suppression System **Quantity One (1)**

A. One (1) Ansul Model No. R-102, automatic liquid chemical system with all components required by NFPA Pamphlet No. 96, installed in hood in accordance with manufacturer's recommendation. Provide duct and plenum protection to Item No. 24 - Exhaust Hood, and surface protection as required to cooking equipment below.

B. Remote manual release in path of egress from protected exhaust hood area. Provide trim ring around pull.

C. Locate top of chemical cylinders as indicated on the drawings at ceiling level and install piping to hoods in a totally concealed manner. Any exposed piping and fittings shall be chrome plated or sleeved with stainless steel tubing. Exposed pipe threads in/above food zone are not acceptable.

D. Mechanical gas shut-off valve (installed in line by plumber).

Item No. 29 – Fire Suppression System **Quantity One (1)**

A. One (1) Ansul Model No. R-102, automatic liquid chemical system with all components required by NFPA Pamphlet No. 96, installed in hood in accordance with manufacturer's recommendation. Provide duct and plenum protection to Item No. 27 - Exhaust Hood, and surface protection as required to cooking equipment below.

B. Remote manual release in path of egress from protected exhaust hood area. Provide trim ring around pull.

C. Locate top of chemical cylinders as indicated on the drawings at ceiling level and install piping to hoods in a totally concealed manner. Any exposed piping and fittings shall be chrome plated or sleeved with stainless steel tubing. Exposed pipe threads in/above food zone are not acceptable.

D. Mechanical gas shut-off valve (installed in line by plumber).

Item No. 30 – 60 Quart Mixer **Quantity One (1)**

A. One (1) Hobart Model No. HL600, 60 quart electric floor type mixer with:
01. 40-quart stainless steel bowl.
02. 40-quart type "B" flat beater, "D" wire whip, dough hook.
03. 40/60-bowl scrapper.
04. 60 quart stainless steel bowl.
05. 60 quart "B" beater.
06. 60 quart "D" wire whip.
07. 60 quart "ED" dough hook.
08. 60 quart bowl scraper.
09. 60 quart bowl truck.
10. 60 quart ingredient chute.
11. VS9-12 vegetable slicer.
12. Grater plate, 3/16” shredder plate, slicer plate and #12 plate holder.

Item No. 31 – Mixer Accessory Rack **Quantity One (1)**

A. One (1) 14-gauge stainless steel, wall mounted mixer accessory rack. Refer to Detail for construction and mounting.

Item No. 32 – Fill Faucet **Quantity One (1)**

A. One (1) T & S Model No. B-0610, wall mount fill faucet. Mounted on wall 44” A.F.F. with stainless steel bracket where indicated on drawings. Construct stainless steel wall bracket per Detail.

Item No. 33 – Mobile Proofer/Holding Cabinet **Quantity One (1)**

A. One (1) Cres-Cor Model No. 121-PH-UA-11D, mobile proofer/heated cabinet.
01. Perimeter bumper.
02. Cord and plug.

Item No. 34 – Worktable **Quantity Two (2)**

A. Two (2) worktable assembly; size and shape as indicated on drawings.

B. Turn free sides down 2" square; ¾” radius corners.

C. One (1) drawer assembly.

D. Open base construction.

Item No. 35 – Worktable **Quantity One (1)**

A. One (1) worktable assembly; size and shape as indicated on drawings.

B. Turn free sides down 2" square; 6” high splash at wall.

C. One (1) Edlund Model No. S-11, table mounted can opener. Mount on table where indicated on drawings.
   01. Rustproof can opener cleaning tool (ST-93).

D. Open base construction.

E. Full length undershelf.

F. Full length overshelf.

Item No. 36 – Mobile Pan Rack **Quantity Three (3)**

A. Three (3) New Age Model No. 1336, mobile pan racks.
   01. Universal slides.

Item No. 37 – Pass Thru Heated Cabinet **Quantity Two (2)**

A. Two (2) Traulsen Model No. AHF232WP-HHS, pass-thru heated cabinets. Provide stainless steel trim at top of units.
   01. Half height doors on serving side. Half height glass doors on kitchen side.
   02. Controls to be mounted on kitchen side.
   03. Door swing as indicated.
   04. Thirteen (13) sets of stainless steel universal angle slides per section.
   05. Stainless steel legs.

Item No. 38 – Pass-Thru Refrigerator **Quantity Two (2)**

A. Two (2) Traulsen Model No. AHT132WPUT-HSS, pass-thru refrigerators. Provide stainless steel trim at top of units.
   01. Half height doors on serving side. Half height glass doors on kitchen side.
   02. Controls to be mounted on kitchen side.
   03. Door swing as indicated.
   04. Thirteen (13) sets of stainless steel universal angle slides per section.
   05. Stainless steel legs.

Item No. 39 – Worktable **Quantity One (1)**

A. One (1) worktable assembly; size and shape as indicated on drawings.

B. Turn free sides down 2" square; 6” high splash at walls and adjacent equipment.

C. One (1) drawer assembly.

D. Open base construction.

E. Full length undershelf.

Item No. 40 – Number Not Used

Item No. 41 – Ice Machine w/Bin **Quantity One (1)**

A. One (1) Hoshizaki Model No. KM-520MAJ, ice machine. Mount ice machine B-500SF, bin with adjustable stainless steel legs.

B. One (1) Everpure Insurice Twin i2000² EV9324-02 water filter system. Mount on wall adjacent to equipment.

C. Insulate drain lines with 1" thick insulation.

Item No. 42 – Microwave Oven/Stand **Quantity One (1)**

A. One (1) Panasonic Model No. NE-2180, microwave oven.
   01. Cord and plug, NEMA 6-30P.

B. One (1) microwave stand; construct per Detail 13, FS-7.
   01. Turn all edges down 2" square.
   02. Open base construction.
   03. Full-length undershelf.
   04. Mount stand on casters with brakes.

Item No. 43 – Clean Dishtable **Quantity One (1)**

A. One (1) clean dishtable assembly; size and shape as indicated on drawings.

B. 1-1/2" rolled rim at free sides; 10" high splash where adjacent walls.

C. Open base construction.

D. Undershelf, as shown on drawings.

E. One (1) wall mounted louvered overshelf.

Item No. 44 – Booster Heater **Quantity One (1)**

A. One (1) Hatco Model No. S-54, booster heater.
   01. Stainless steel body and base.
   02. Adjustable stainless steel legs.
   03. Shock absorber.
   04. Water treatment system.

Item No. 45 – Dish Washer **Quantity One (1)**

A. One (1) Hobart Model No. CL44e BAS, dish washer with 1" shorter stainless steel legs.
   01. Direction of operation per drawings.
   02. Single point connection.
   03. Electric tank heat.
   04. Stainless steel front panel.
   05. Stainless steel vent hoods.
   06. Vent fan control.
   07. Auto fill.
   08. Stainless steel splash guards.
   09. Four (4) PEG racks, four (4) COM racks, and two (2) P1400 open end racks.
   10. Provide sheet pan height chamber.

Item No. 46 – Vent Duct **Quantity Two (2)**

A. Two (2) 18-gauge stainless steel fully welded vent ducts with stainless steel angle collar at ceiling. Extend 6" above finished ceiling. Refer to Detail 20, FS-7 for construction.

Item No. 47 – Soiled Dishtable w/Roll Down Door **Quantity One (1)**

A. One (1) "ell" shaped soiled dishtable assembly w/roll down door; size and shape as indicated on drawings.

B. 1-1/2" rolled rim at front; 10" high splash where adjacent to walls.

C. One (1) 21"" x 21" x 7" deep disposer sink. Provide stainless steel removable rack guide.

D. Install disposer and control where indicated.

E. One (1) T & S Model No. B-0163, pre-rinse with Model No. B-0107-C, spray valve unit with low flow spray head with B-0109, wall bracket and two (2) Model No. BCVH ½" check valves.

F. One (1) Component Hardware Model No. E18-1824, duo mini basket drain.

G. Provide milk trough where indicated on drawings.

H. Provide 30" high recess at pass-thru window.

I. One (1) Cookson Model No. CDF, stainless steel roll down door with stainless steel coil and stainless steel frame less sill. Verify opening dimensions with Architect's plans. At pass window extend soiled dishtable top out through window and turn down 2" on dining room side.

J. Open base construction.

Item No. 48 – Disposer **Quantity One (1)**

A. One (1) Salvajor Model No. 200- SA, disposer with 6-1/2" diameter sink collar.
   01 One (1) Model No. ARSS-LD, control panel. Mount on stainless steel bracket where indicated.
   02. Dejamming prong.

B. Mount in Item No. 47 - Soiled Dishtable/Roll Down Door.

Item No. 49 – Serving Counter **Quantity Two (2)**

A. Two (2) Mod-U-Serve Model No. MCT-MUS, modular utility systems. Refer to drawings for configuration.
   01. Stainless steel construction, UL listed utility wall providing utility connections from floor to the serving line modules.
   02. Corian cap with bullnose turn down and half round stainless steel runners.
   03. Continuous tile front by Mod-U-Serve. Color and pattern to be selected by Architect and owner.
   04. 120/208V, 3 phase electrical service with point of use breakers at each receptacle provided. 60-amp circuit required in floor stub to power UDS wall.
   05. ¾" hot and ¾" cold water connections located inside utility wall with quick disconnect connections for counter components. Quick disconnect hoses provided by Mod-U-Serve where necessary.

06. Cutout for “shoot gun” size food pan in the cap adjacent to the cashier stand.
07. LED light mounted under cap turn down to illuminate front.

B. Two (2) Mod-U-Serve Model No. MCT-HF5-MOD, hot food counters. Refer to drawings for configuration. Serving counter top to be 14-gauge stainless steel.
a. Provide with five (5) 12" x 20" hot food wells with infinite control switch. Controls mounted in rear apron of counter.
b. Elite IV single tier, adjustable breath guard with heat lamp and light. Full height front glass panel.
c. Provide fill faucet and hose at location shown on drawing with hot/cold mixing valve.
d. Manifold drains to single drain valve located below counter.
e. Full length, 18-gauge stainless steel undershelf.
f. Mount counter on heavy-duty, adjustable 5" polyurethane casters, with brakes.
g. Provide interlocking mechanism.

C. Two (2) Mod-U-Serve Model No. MCT-CFSP2-MOD, cold food counters. Refer to drawings for configuration. Serving counter top to be 14-gauge stainless steel.
01. Mechanically cooled frost top with capacity for (2) 18" x 26" sheet pans. Controls mounted in rear apron of counter.
02. Elite IV dual tier, adjustable breath guard with a single 18” x 26” sheet pan frost top in the intermediate tier and LED lighting on both tiers. Half height front glass panel on counter level tier only.
03. Full length, 18-gauge stainless steel undershelf.
04. Mount counter on heavy-duty, adjustable 5" polyurethane casters, with brakes.
05. Provide interlocking mechanism.

D. Two (2) Mod-U-Serve Model No. MCT-CRSG/IC-20-20, ice cream and cashier counters. Refer to drawings for configuration. Serving counter top to be 14-gauge stainless steel.
01. Mechanically cooled ice cream well with stainless steel wire baskets and bi-folding hinge lid. Provide 2 additional stainless steel wire baskets.
02. Sloped snack rack above ice cream well with LED light mounted under snack bin.
03. Provide Vollrath Model No. 30562, silverware pan dropped into trayslide cut-out.
04. Locking cash drawer with plastic cash till insert.
05. Tiled locking front door
06. Full length, 18-gauge stainless steel undershelf.
07. Mount counter on heavy-duty, adjustable 5" polyurethane casters, with brakes.
08. Provide interlocking mechanism.

Item No. 50 – Number Not Used

Item No. 51 – Milk Coolers **Quantity Two (2)**

A. Two (2) Mod-u-Serve Model No. MCT-DM2, milk coolers.
01. Provide air curtains.
02. 12 case milk cooler with self-contained refrigeration on slide out bracket.

Item No. 52 – Tray Dispenser **Quantity Two (2)**

A. Two (2) Piper/Serv-o-lift Model No. TCA-ST-MOD, tray dispensers modified for two (2) stacks of trays.
01. One (1) piece wrap around, non-marking vinyl bumper.
02. Verify tray size with owner.

Item No. 53 – Digital Menu Boards **Quantity Two (2)**

A. By Architect.

Item No. 54 – Washer/Dryer **Quantity One (1)**

A. By Owner.

Item No. 55 – Janitor's Shelving **Quantity One (1) Lot**

A. Cambro Shelving, five (5) tiers high, each section with four posts.
   01. One (1) CPU244872V5480 Camshelving® Starter Unit 5 Shelves 24X48X72.

Item No. 56 – Fly Fan **Quantity One (1)**

A. One (1) Mars Model No. HV248-1UD, fly fan.
   01. Install micro switch in doorframe so unit operates when door is open.

B. Mount at receiving door as indicated.

Item No. 57 – Utility Cart **Quantity One (1)**

A. One (1) Lakeside Model No. 422, utility cart.

END SECTION 11 40 00

SECTION 11 52 13

PROJECTION SCREENS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide electric projections screens as indicated on the Drawings and specified herein.

C. Related Work:
   01 Section 05 50 00 – Metal Fabrications
   02 Section 09 21 16 – Gypsum Board Assemblies
   03 Division 26 - Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembly components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Operations and Maintenance Manuals
   01 Provide complete operations and maintenance manuals to the Owner.
   02 Refer to section 01 78 23 – Operations and Maintenance Manuals
   03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. National Fire Protection Association:
   01 NFPA 70 – National Electric Code
   02 NFPA 701-99 – Fire Tests for Plame Resistant Textiles and Films

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of projection screen required from a single manufacturer as a complete unit, including necessary mounting hardware and accessories.

B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of projection screens are based on products manufactured by Draper.

B. Other acceptable manufacturers: the following manufacturers are acceptable provided proposed products meet or exceed the specified basis of design products and all specified requirements.
   01 Da-Lite
   02 Elite Screens
   03 Screen Innovations

2.2 ELECTRIC PROJECTION SCREENS

A. Electric Projection Screens: Design is based on Draper Premier XL Electric Projection Screen.

B. General:
   04 Electric motor operated, metal case, tab tensioned.
   05 Metal roller mounted on rubber isolation mounts.
   06 Case consists of a curved front and L-shaped back/top cover fabricated of extruded aluminum, with endcaps forming ceiling hanging bracket.
   07 Case 6-3/4 inches high x 6-3/4 inches deep (172 mm high x 172 mm deep).
   08 Case and tensioning dowel finished in flat black.

C. Operation:
   01 Motor mounted inside screen roller on rubber isolation insulators.
   02 Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
   03 Locate controls where indicated on the Drawings.

D. Controls:
   01 All controls shall be UL certified.
   02 Key operated 3-position control switch rated 115V AC, 60 Hz to stop or reverse screen at any point.
   03 Refer to Electrical Drawings for location.

E. Projection Viewing Surface:
01 Mildew resistant 100 percent vinyl with black masking borders and 12 inch (305 mm) black drop.
02 Matt White XT1000V – On Axis gain of 1.0.
03 180 degree viewing cone.
04 4K ready.

F. Tab-Tensioning System:
01 Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface.
02 Viewing surface and tabs CNC cut as a single piece.
03 Tabs RF welded to the back of viewing surface to prevent tab separation.
04 Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel.
05 Warranted for five (5) years against tab separation.

G. Viewing Area:
01 Viewing Area Size (nominal): Cafetorium: Viewing size HDTV 121" x 216"
02 Provide extra screen drop for viewing area to be lowered to 48" above finish floor.
03 Provide black masking borders.

2.3 MANUAL PROJECTION SCREENS

A. Manual Projection Screens: Design is based on Draper Salara M with AR Manual Projection Screen

B. General:
01 Spring roller operated.
02 Elliptical extruded aluminum case with domed endcaps.
03 Finish to be white painted finish.
04 Viewing surface securely attached to steel roller at top and at bottom to roll formed steel dowel which is finished white.
05 System Options: Auto Return spring roller with built-in inertia reduction mechanism to ensure viewing surface retracts slowly, smoothly and quietly into case.

C. Projection Viewing Surface:
01 Matt White XT1000E – On Axis gain of 1.0.
02 180 degree viewing cone.
03 Washable surface.

D. Viewing Area H x W:
01 121" W x 216" H

E. Mounting:
01 Mounted to wall with floating brackets.
02 Minimum projection from wall shall be 6" to screen surface.
03 Mount at 96" above finish floor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify rough-in openings are properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install front projection screens with screen cases in position and relationship to adjoining construction as indicated, securely anchored to supporting substrate, and in manner that produces a smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when screen is lowered.

C. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 11 52 23

AUDIO-VISUAL EQUIPMENT SUPPORTS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CC AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide audio-visual equipment supports at all televisions indicated on the Drawings.

C. Related Work:
   01 Section 10 00 00 – Miscellaneous Specialties.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

PART 2 - PRODUCTS

2.1 TELEVISION MOUNT SUPPORTS

A. Tilt-Wall Mount:
   01 Design is based on Peerless Industries model PT650 wall mount bracket for 32" to 56" flat panel televisions
   02 Universal pattern capability.
   03 Tilt: + 15 degrees forward to – 5 degrees backward with fix tilt capability.
   04 Swivel: 90 degrees
   05 When collapsed, unit less than 4.5" from wall; and full extension to minimum 25".
   06 Provide with double stud wall plate and all necessary mounting hardware.
   07 Provide all fasteners and components necessary for a complete installation.

B. Articulating Wall Mount:
   01 Design is based on Peerless Industries model ESA763PU wall mount bracket for 37" to 63" flat panel televisions
   02 Universal pattern capability.

03 Tilt: + 15 degrees forward to – 5 degrees backward
04 Swivel: 90 degrees
05 When collapsed, unit less than 4.5” from wall; and full extension to minimum 25”.
06 Provide with double stud wall plate and all necessary mounting hardware.
07 Provide all fasteners and components necessary for a complete installation.

C. Ceiling Mount:
01 Design is based on Peerless Industries model PLCM-UN1 straight column ceiling mount bracket for 32” to 65” flat panel televisions
02 Universal pattern capability.
03 Tilt: 0 to 20 degrees
04 Swivel: 360 degrees
05 Support: 1-1/2” – 11.5 NTP schedule 40 pipe. Verify length required for proper mounting height.
06 Provide with model CMJ450 Suspended Ceiling Plate and all necessary mounting hardware.
07 Provide all fasteners and components necessary for a complete installation.

2.2 TELEVISION SIZES, COUNTS AND LOCATIONS

A. TV sizes are to be as follows:
01 Cafeteria/Kitchen – Four (4) at 55”
02 Conference Room – Two (2) at 65”
03 Principal’s Office – One (1) at 55”
04 Main Entry – One (1) at 55”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate as required for installation of blocking in walls to support wall brackets.

B. Install manufacturer's wall support plates in wall cavity at all TV wall mounted locations and secure to studs.

C. Install manufacturer's structural ceiling mount at all TV ceiling mounted locations. Secure suspended ceiling mount plate to structure.

D. Install in accordance with manufacturer's printed instructions.

E. Adjust for proper operation.

END OF SECTION

SECTION 11 61 43

STAGE CURTAINS

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CC AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Section AB – Instructions to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide theater curtains as indicated on the Drawings.
   02 Locations:
      a. Stage
   03 Types of Curtains:
      a. Front stage curtain and valance
      b. Act curtains, tormentors, teasers and borders
      c. Cyclorama

C. Related Work:
   01 Section 05 12 00 – Structural Steel Framing
   02 Section 05 50 00 – Metal Fabrications

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop drawings shall be sealed and signed by a Texas Registered Engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.

02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
01 Provide two (2) samples of each fabric finish for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 8" x 8" but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals:
01 Provide complete Operations and Maintenance manuals to the Owner.
02 Refer to Section 01 78 23 – Operations and Maintenance Manuals.
03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. Certificate: Furnish certification that the stage curtains are flame-proofed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of stage curtains track systems is based on products manufactured by Automatic Devices Co.

B. The following manufacturers are acceptable provided proposed products meet or exceed all specified requirements.
01 H & H Specialties
02 Kendall Stage Curtains
03 Mid Atlantic Stage
04 National Stage Equipment
05 Texas Scenic

C. Design of stage curtains material is based on products manufactured K-M Mills (K-M Fabric).
01 Equivalent fabrics by other manufacturers should be submitted to the Architect for inclusion by Addendum.

2.2 MATERIALS - CURTAINS

A. Front Stage Curtain and Valance:
01 Design of front stage curtain and valance is based on K-M Mills "Charisma" synthetic, heavyweight, 100% IFR polyester matte woven velour fabric.
02 Flame-proofed 23.5 to 24.5 ounce per linear yard velour finish fabric.
03 Noise Reduction Coefficient: 0.90.
04 Sound Absorption Average: 0.90.
05 Full length without seams for entire length of drape.
06 100% fullness.
07 Serge seams.
08 To bear label certifying inherently fire retardant.
09 Color as selected by Architect from manufacturer's standard colors.

B. Act Curtains, Tormentors, Teasers and Borders:
01 Design of front act curtains, tormentors, teasers and borders is based on K-M Mills "Crescent" synthetic, medium weight, 100% IFR polyester matte woven velour fabric.

02 Flame-proofed 18 to 20 ounce per linear yard velour finish fabric.
03 Noise Reduction Coefficient: 0.95.
04 Sound Absorption Average: 0.96.
05 Full length without seams for entire length of drape.
06 Color shall be black.
07 75% fullness.
08 To bear label certifying inherently fire retardant.
09 Color as selected by Architect from manufacturer's standard colors.

C. Cyclorama:
01 Design of cyclorama fabric is based on K-M Mills "Chevron" synthetic, medium weight 100% IFR polyester masking fabric.
02 Flame-proofed 18.5 ounce per linear yard velour finish fabric.
03 Full length without seams for entire length of drape.
04 75% fullness.
05 To bear label certifying inherently fire retardant.
06 Color shall be black.

2.3 MATERIALS – CURTAIN TRACK SYSTEMS

A. Tracks shall be a complete system including all tracks, pipes, pipe hangers and all accessories required for a complete, functioning assembly.

B. Front Stage Curtain Track: Design is based on Automatic Devices Co. Model 170 Series complete track assembly.
01 Track shall be two sections complete with endless line and floor block.
02 14-gauge galvanized steel construction entirely enclosed except for slot in bottom.
03 Each half to be in one continuous piece except where splicing clamps is required.
04 Each curtain carrier shall be spaced on 12" centers and shall be of plated steel construction with two polyethylene wheels held to the steel block by a rust proof nickel plated rivet, such wheels rolling on two separate parallel treads.
05 Each curtain carrier shall consist of a free-moving plated swivel to accommodate curtain snap hook.
06 Live-end pulleys shall be adjustable and shall be equipped with 1-13/16" diameter sleeve-bearing wheels adequately guarded.
07 The manufacturer shall furnish two end stops for placement at each track end and a tension floor pulley for increasing cord tension.
08 Stretch-resistant operating cord for hand operated track systems, shall have synthetic center and shall be of 1/4" diameter, extra quality yarn.
09 Provide all components and accessories required for a complete, operating system.

C. Cyclorama Track: Design is based on Automatic Devices Co. Model or142-R complete track assembly.
01 Provide in configuration as indicated on the Drawings.
02 System shall be walk-along type.
03 Track shall be two sections with each track operated by separate lines.
04 11-gauge extruded aluminum I-Beam construction consisting of a center rib and top, intermediate and bottom flanges.
05 Each curtain carrier shall be spaced on 12" centers and shall be of steel construction to include two nylon-tired ball-bearing wheels rolling on two separate parallel treads.
06 Each curtain carrier shall consist of a free-moving plated swivel to accommodate curtain snap hook.

07 Nylon snap-on spacers shall be attached to wheel supports of curtain carriers.
08 Track shall be rigidly supported from ceiling clamps or hanging clamps.
09 Curves shall be formed on-the-job or at the factory.
10 1-1/4" I.D. stiffening pipe or the equivalent shall be used to support both straight and curved areas of all suspended curved tracks.
11 Provide all components and accessories required for a complete, operating system.

D. Pipe Hangers:
01 Schedule 40, 1 1/2 inch galvanized pipe, supported from structure above by #2/0 chains at 4'-0" O.C. maximum.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate curtains using multiple widths of 54-inch wide velour without splicing within any panel.

B. Curtains shall be 50% fullness. Tops of curtains shall have a 3 1/2 inch 9-pound jute webbing, with no less than two (2) rows of stitching. Pleats shall be 12 inches on center.

C. Curtains shall have #3 brass grommets with "S" hooks or tie line for attachment.

D. Curtain hem shall be 5 inches with chain pocket and 2/9 chain. Outside hems shall be 4 inches, and border hems shall be 4 inches.

E. All seams shall be 5-thread serge with all salvage material removed.

F. Center hem of front and concert curtains shall be 1 foot.

3.2 INSTALLATION

A. Verify dimensions and space conditions prior to fabrication.

B. All equipment shall be installed securely by hanging from structural members. Provide all necessary steel members, hangers and supports for the support chains, if necessary.

C. Curtains shall be finished properly in the best manner and method of the industry. After hanging, adjust for a smooth and quiet operation. Thoroughly brush curtains to remove all dust, loose threads, fabric lint, etc. Wrinkles shall be allowed to fall out naturally.

D. On completion of the Work, remove all rubbish and trash from the site, and leave the area in a clean, dust free condition.

END OF SECTION

SECTION 11 66 23

GYMNASIUM EQUIPMENT

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CC AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work: Provide the following as indicated on the Drawings:
   01 Basketball backstops and goals.
   02 Volley ball uprights, nets and floor anchors.
   03 Wall padding
   04 Soccer goals.

C. Related Work:
   01 Section 03 30 00 - Cast-In-Place Concrete
   02 Section 04 20 00 – Unit Masonry
   03 Section 09 21 16 – Gypsum Board Assemblies
   04 Section 09 64 19- Gymnasium Flooring

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples
   01 Provide two (2) samples of each finish for selection by the Architect.

02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals
01 Provide complete operations and maintenance manuals to the Owner.
02 Refer to section 01 78 23 – Operations and Maintenance Manuals
03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.
01 Basketball goal system – 25 years.
02 Backstop Winch – 5 years.

1.3 WARRANTY

A. Warrant the Work specified for one (1) year against becoming unserviceable or causing an objectionable appearance, resulting from either defective or nonconforming materials and workmanship.

B. Defects shall include, but not be limited to the following:
01 Rough or difficult operation.
02 Noisy operation.
03 Loose or missing parts.
04 Noticeable deterioration of finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of gymnasium equipment is based on products manufactured by Porter Athletic.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide one or more products of this section, provided all proposed products meet or exceed the specified requirements.
01 Aalco Manufacturing Co.
02 Athletics, Inc.
03 Amerec Corp.
04 BPI, Basketball Products International
05 Draper
06 Douglas Industries
07 Sports Imports (volleyball equipment only)
08 ADP Lemco

C. It is the goal of the Owner to have a single source for all gymnasium equipment, unless stated otherwise.

2.2 MATERIALS – OPERABLE BASKETBALL GOALS

A. Operable Basketball Goal and Accessories: Design is based on Porter Athletics series 950 Ceiling Suspended, Forward fold, Front Braced Basketball Goal Assembly.

B. Backstop / Mast Assembly:

01 Basketball backstop shall consist of a main center mast of 6-5/8" O.D. heavy-wall structural steel tube with diagonal side sway braces of 2-1/2" x 1-1/2" rectangular steel tubing.

02 Ends of diagonal brace tubes shall be fully welded to main mast.

03 The 6-5/8" O.D. main stem of the drop frame shall be suspended diagonally from the superstructure with a 15 angle and a 4'-6" long vertical member for attachment of a backboard.

04 Top horizontal mast member to be of a heavy 4" structural channel to support adjustable suspension hangers.

05 Mast shall be fully welded and suspended by adjustable hangers (2) to provide for precise plumbing of frame during installation.

06 The 15 camber of the main drop frame will properly weight lock unit in the playing position.

07 Goal shall mount directly through backboard and into a heavy structural steel Center-Strut weldment which shall be clamped to the vertical 6-5/8" O.D. center support to eliminate any strain on backboard should a player hang on the front mounted goal (conforms to the NCAA latest rules).

08 All fittings shall be attached to the 6-5/8" O.D. vertical drop tube by heavy 1/4" thick precision saddle die-cut formed steel fittings secured in place by 5/8" diameter 'U'-Bolt type hardware.

09 Backstop to operate with a 1-7/8" O.D. front brace assembly with a folding knee joint.

10 Knee joint to incorporate an internal torsion spring design to lock brace assembly firmly in playing position. Hoist cable shall automatically disengage brace knee joint during the hoist cycle through a three-pulley system.

11 Backstop shall be supported from pipe anchored to roof framing members by precision die formed support fittings or custom attachments as required.

12 All cap screws shall be rated a minimum SAE Grade 5. Grade 2 cap screws will not be approved as equal. Bridged pipes may be required when spans exceed 14'.

13 All metal parts shall be powder coated; color as selected by the Architect from manufacturer’s full range of colors.

C. Provide with backboard with height adjustment capability.

01 Rim height adjustable from 8’-0” to 10’-0” above floor.

02 Key switch operated.

D. Backbaord and Goal:

01 Center-Strut Ceiling suspended forward-fold backstop: Porter No. 950.

02 Design is based on Rectangular glass backboard: Porter No. 208-000-Backboard.

03 Size: 3’-6” x 6’-0”

04 Goal: Porter Athletics Series 00254 goal with No. 223 net.

05 Backboard Padding: Design is based on Porter Athletics Series 326 Pro-Pad Padding Kit.

a. Bolt-on type.

b. Color as selected by the Architect from manufacturer’s full range of colors.

E. Backstop Winch System:

01 Design is based on Porter Athletics Series 712 – 3/4 HP Electric Winch for each backstop location.

02 Winch shall be worm gear type, designed to hold backstop at any position when raising or lowering.

03 Winch frame shall be heavy gage painted steel.

04 The cable drum is extruded aluminum, machined with grooves to provide neat and consistent cable tracking.
05 A torsion spring tensioner ensures cable will keep alignment, even under no load.
06 Cable provided is 1/4" 7x19 galvanized steel aircraft cable. Drum will hold 41 ft of cable on a single layer.
07 The top speed of the cable is 14.3 feet per minute.
08 The heat-dissipating gearbox contains a worm and gear set in a factory-filled oil bath which is completely sealed for maintenance free service.
09 Winch to be operated mechanically by means of a 3/4 HP (10.2 Amps, loaded) capacitor type 60 cycle, 115 Volt, single phase electric motor with automatic thermal overload protection manufactured to NEMA specifications.
10 The motor is rated for a 15 minute duty cycle.
11 Drum shall be mechanically interconnected to an Up-Down limit switch assembly, which shall be mounted and pre-wired to motor as an integral part of the winch.
12 Winch shall be pre-wired with a 6'-0" long covered cable with NEMA L14-20 twist-lock grounded type plug attached.

F. Winch Control:
01 Design is based on Porter Athletics Series XELE 00791 Key Switch Assembly.
02 Momentary key switch with Up – Off – Down settings.
03 Provide individual or ganged switches as indicated on the Drawings.
04 For multiple keyed switches, provide a master key that can control any / all key switches.

2.3 MATERIALS – WALL-SUPPORTED STATIONARY BASKETBALL GOALS

A. Design is based on Porter Athletics Series 90312 Wall Mounted Center Strut Adjustable Height Backstop.
01 Adjustable height from 8’-0” to 10’-0” above finish floor.
02 Refer to Drawings for stand-off from wall.

B. Backboard and Goal
01 Design is based on Wall mounted backstop: Porter No. 00312-FFH series.
02 Design is based on Porter No. 00267-698 fiberglass fan shaped Backboard.
03 Size: 3’-6” x 6’-0”
04 Goal: Porter Series 00254 goal with No. 223 net.
05 Backboard Padding: Design is based on Porter Athletics Series 326 Pro-Pad Padding Kit.
a. Bolt-on type.
b. Color as selected by the Architect from manufacturer’s full range of colors.

C. Provide expansion anchors at wall supports.
01 Expansion anchors set into concrete filled CMU back up wall.
02 Coordinate as required to assure correct locations of concrete filled CMU cells.
03 Expansion anchor quantities, locations and sizes shall be by basketball goal manufacturer as required.

2.4 MATERIALS – OUTDOOR BASKETBALL GOALS

A. Design based on Porter Athletics Series 164 Vertical Outdoor Backstop, complete.

B. Upright and Support:

01 Pipe Upright: 4-1/2" schedule 40 steel pipe, with studs for cast in concrete footing.
02 Horizontal Support: 3'1/2" minimum 8-gauge steel tubing specifically designed to transfer goal impact loads directly to rear support.
03 All steel components shall be galvanized.
04 Provide powder coat finish as selected by Architect from manufacturer's standard colors.

C. Backboard and Goal
01 Provide Porter Athletics Series 216 Fiberglass Backboard.
02 Goal: Porter No. 0033-H00 Power-Flex Outdoor Goal.
03 Padding
a. Provide Porter Athletics 1870XX upright padding, 72" high.
b. Provide Porter Athletics Series 326 Pro-Pad Padding Kit.

D. Outdoor Basketball Backstops / Goals:
01 Height adjustable basketball standard, backstop and goal. Porter No. 09532-000 system, complete.
02 Crank type height adjustment.
03 Extension: 4'-3".
04 Torq-Flex outdoor goal. Porter No. 00214-000. Complete with padding and goal.
05 Padding at standard upright.

2.5 MATERIALS – VOLLEYBALL ASSEMBLIES

~~A.~~ Volleyball Assembly: Design is based on products provided by Model HM-50
01 Uprights: / End Standards: Model DE-11, complete with sleeves, uprights, winch and sleeve cover plates.
a. 4 pair required
02 Nets: Porter Model 2295, complete.
a. 4 required
03 Floor Plates and Sleeves: Model KA-25; 6 pair required
04 Volley Ball Upright Pads: Model FP-1; 8 required
05 Officials Stands: Two (2) required
a. Model DE73 International Official Stands
b. Model OSP-3 Officials Stand Safety Padding

B. Volleyball Assembly:
01 Uprights: Model DE-11: 4 pair required
02 Nets: Model HM-50; 4 required
03 Floor Plates and Sleeves: Model KA-25; 6 pair required
04 Volley Ball Upright Pads: Model SP-1; 8 required
05 Officials Stands: Two (2) required
a. Model DE73 International Official Stands
b. Model OSP-3 Officials Stand Safety Padding

C. Safety Wall Pads:
01 Fire retardant safety wall pads: Porter No. 00346 series 1-1/2" wall pads, 5'-10" tall.
02 Provide Porter No. 00347 series attachment clips system as required.
03 Provide 16'-0" length pads at each indoor basketball goal.
04 Provide inside / outside corner units as required for wall configuration.
05 Color as selected by the Architect from manufacturer's standard color selection.

2.6 MATERIALS – OPERABLE BASKETBALL GOALS

A. Soccer Goals:
01 Regulation soccer goal: Porter No. 279, 8’ x 24’ x 4’B x 10’D.
02 2” x 4” aluminum face frame with radius corners.
03 2” diameter standard back-sway and rear cross-bar.
04 Net: 4mm braided netting in standard color as selected by the Architect.
05 Semi-permanent mounting. Provide mounting sleeves and concrete footings for semi-permanent mounting as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Basketball Backstops:
01 Install in lay-out and configuration indicated on the Drawings, in accordance with reviewed submittals.
02 Install operable basketball backstops with cable and winches necessary for each unit.
03 Backstops to be suspended from and braced back to roof structure. Provide support structure and coordinate as required.
04 Install electrically operated switches as indicated on the Drawings.

B. Volleyball Standards:
01 Install in lay-out and configuration indicated on the Drawings, in accordance with reviewed submittals.
02 Provide upright sleeve anchors for casting into slab.

END OF SECTION

SECTION 12 21 13

HORIZONTAL LOUVER BLINDS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide horizontal blinds at all exterior windows as indicated on the Drawings.
   02 Provide at interior windows as indicated or scheduled on the Drawings.

C. Related Work:
   01 Section 08 11 13 – Hollow Metal Doors and Frames
   02 Section 08 80 00 – Glazing

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of horizontal louver blinds is based on products manufactured by Hunter Douglas, Inc. Celebrity mini blinds or equivalent by another listed manufacturer with 1" wide, .006 gauge aluminum slats. Color: alabaster, or as approved by Owner.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this section, provided all proposed products meet or exceed the specified requirements.
   01 Hunter Douglas, Inc
   02 Levolor Lorentzen, Inc
   03 Spring Window Fashions Division

2.2 MATERIALS

A. Design of horizontal louver blinds is based on Hunter Douglas Celebrity Mini Blinds.

B. Horizontal blinds shall consist of the following:
   01 Steel Channel Headrail: 'U'-shaped, 1" high x 1-1/2" deep, fabricated from .025 inch thick phosphate-treated steel with rolled edges at top, with a prime coat of vinyl primer and finish coat of polyester baked enamel to match bottom rail and slats.
   02 Head Channel Hardware: Metal hardware shall be electroplated. Provide lift cords and braided ladders.
   03 Enclosed Metal Bottom Rail: Tubular shape, .030 inch thick phosphate-treated steel with prime coat of vinyl primer and finish coat of polyester baked enamel matching headrail and slat color.
   04 Slats: Slats shall be virgin aluminum alloyed for maximum strength, flexibility and resistance to internal and external corrosion.
      a. Slats shall be nominal 1 inch wide; minimum 0.006” aluminum slats.
      b. Slats shall have a pre-coating treatment to bond the polyester baked enamel finished coating.
      c. Total coating thickness shall be minimum 1.0 mil.
      d. Color as selected by the Architect from manufacturer’s full range of selections.
   05 Tilter: Wand-type shall be operated by a length of transparent extruded plastic rod with a multi-sided cross-section measuring approximately 3/8 inch across points for comfortable grip.
      a. Plastic wand shall be easily detachable by means of a wand link and sliding crystal sleeve.
      b. Tilter shall be snap-fitted to headrail using no rivets or metal cleats.
   06 Braided Ladders:
      a. Distance between end ladder and end of slats shall not exceed 6 inches.
      b. Distance between ladders shall not exceed 22 inches.
      c. Material shall be polyester yarn. Vertical component shall be not less than .045 inch dia. nor greater than .066 inch diameter.
   07 Cord lock and tilter operation locations: Tilter at left, cord lock at right (standard).
   08 Installation brackets: End support, hinged cover brackets .042 inch thick treated steel with prime coat of epoxy primer and finish coat of polyester baked enamel in color to match headrail.
      a. Brackets shall be marked left and right to facilitate installation and shall have a 1-1/4 inches extra-wide top to accommodate power screwdriver.
   09 Intermediate support brackets: Brackets shall be furnished for blinds over 60 inches wide. Maximum spacing for intermediate support brackets shall be 48 inches.
   10 Install valance brackets and double blade stacked slats at top of all blinds.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate blinds to fit outside to outside of window frame, with length to extend full height down to sill / floor as applicable, unless indicated otherwise on the Drawings.

B. For window blinds mounted at 9’-0” or above, provide extensions to control mechanisms.

3.2 INSTALLATION

A. Install blinds at all exterior windows, and other locations scheduled or noted on the Drawings in accordance with manufacturer's installation procedures, except as otherwise specified herein.

B. Install intermediate support brackets and extension brackets as needed to prevent deflection in headrail.

C. Inside mount blinds with adequate clearance to permit smooth operation of blinds and any sash operators. Hold blinds 1/4 inch clear from each side of window opening unless other clearance is indicated.

D. Set tilt and locking controls. Demonstrate blinds to be in smooth uniform working order.

3.1 CLEANING AND DEMONSTRATION

A. Clean blinds in accordance with manufacturer’s instructions.

B. Demonstrate blinds to be in smooth uniform working order.

END OF SECTION

SECTION 12 32 16

MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Plastic laminate clad casework.
   02 Plastic laminate clad countertops.
   03 Casework hardware and accessories.
   04 Plastic laminate clad wall panels
   05 Plastic laminate window sills and other miscellaneous plastic laminate clad work as indicated on the Drawings.

C. Related Work:
   01 Section 04 20 00 – Unit Masonry
   02 Section 06 10 00 – Rough Carpentry
   03 Section 06 20 00 – Finish Carpentry
   04 Section 09 21 16 – Gypsum Board Assemblies
   05 Division 22 – Plumbing
   06 Division 26 – Electrical

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Submit a copy of the Specification Section with any / all proposed deviations clearly marked and identified in red text / markings.
   01 For each item of non-compliance, indicate such and provide complete, detailed description of what is proposed in lieu of the specified item / requirement.
   02 Proposed alternatives for items of non-compliance may be accepted or rejected by the Architect; and in the case of rejection, the specified requirements shall be met.

C. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

D. Proof of AWI Quality Certification Program accreditation.

E. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

F. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details, including details of all joinery and assemblies.
   03 Show details of field fabrications, connections and details.
   04 Provide full elevations of all proposed casework. Indicate dimensions, materials and finishes. Indicate all locations to receive filler panels.
   05 Show locations of hardware, service fixtures, trim and other pertinent data for each unit.
   06 Indicate proposed laminate materials (type and thickness) for every surface of the cabinet unit (exposed, semi-exposed, interior and concealed).

G. Sample Cabinet:
   01 Submit typical sample base cabinet (with base) representative of all proposed methods of construction, assembly, joinery and finish.
   02 Sample must include a minimum of one drawer, one door, one interior shelf and removable countertop with attached backsplash.
   03 Sample cabinet does not need to have specific, selected plastic laminate finishes for this project.
   04 Once accepted, the sample cabinet shall be used as the basis to evaluate all casework provided for the project.

H. Samples:
   01 Submit plastic laminate samples (exposed surfaces and liners) of the full range of colors, patterns, textures and finishes from the manufacturer's standard colors, for Architect's selections.
   02 Submit full range of selections available for 3mm PVC edge banding and PVC flat edge banding.
   03 Submit samples of all hardware components proposed to be used.

1.3 DEFINITIONS

A. Identification of casework components and related products by surface visibility.
   01 Exposed Surfaces: Any unit exterior surface exposed after installation (door and drawer faces, face frames, exposed ends, unit tops below 72” AFF, and bottoms of upper cabinets above 60” AFF).
   02 Semi-Exposed Surfaces: Tops of units above 72” AFF, bottoms of upper cabinets below 60” AFF, unit interiors which are visible).
   03 Open Interior Surfaces: Any open unit without solid door or drawer front, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
   04 Closed Interior Surfaces: Any visible surface behind solid door or drawer fronts.
   05 Concealed Surfaces: Any surface not visible after installation (unit backs and ends when adjacent to another unit.

1.4 QUALITY ASSURANCE

A. Manufacturer: Minimum of five (5) years of experience in providing manufactured casework systems for similar types of projects, and adequate facilities and personnel required to perform on this project in accordance with the specified requirements.

B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.

C. Single Source Manufacturer: Casework, countertops and other plastic laminate architectural products must all be engineered and built by a single source manufacturer in order to ensure consistency and quality for these related products.

D. Quality Standard: Unless otherwise indicated or specified, comply with AWI's Architectural Woodwork Quality Standards for grades of interior architectural woodwork, construction, finishes and other requirements.

E. The manufacturer shall be a member of AWI and shall be Quality Certification Program accredited:
   01 Provide AWI Quality Certification Program Certificate indicating that the woodwork complies with requirements of the grade specified.
   02 This project has been registered as AWI/QCP Certification Program project number.
   03 The contractor, upon award of work, shall register the work under this section with the AWI Quality Certification Program.

1.5 WARRANTY

A. Furnish a written warranty that Work performed under this Section shall remain free from defects as to materials and workmanship for a period of three (3) years from date of acceptance. Defects in materials and workmanship that may develop within this time are to be replaced without cost or expense to the Owner.

B. Defects include, but are not limited to:
   01 Ruptured, cracked, or stained coating.
   02 Discoloration or lack of finish integrity.
   03 Cracking or peeling of finish.
   04 De-lamination of components or edge-banding.
   05 Slippage, shift, or failure of attachment to wall, floor, or ceiling.
   06 Weld or structural failure (visible weld marks).
   07 Warping or unloaded deflection of components.
   08 Failure of hardware.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Design of educational casework is based on products as manufactured by TMI Systems Corporation / Texas Distributor: Specialty Supply & Installation Company.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Jericho Woodworks
   02 MGC, Inc.
   03 LSI Corpoartion
   04 South Texas Woodmill
   05 CSI Millwork
   06 Jim Reynolds & Associates
   07 Texas Woodwork Interiors
   08 Alpha and Omega Casework

C. Casework of other recognized casework manufacturers may be considered for approval.
   01 Casework must conform to design, quality of materials, design intent, workmanship and exact performance function of casework components and details specified and implied by basis of design manufacturer's reference, and as shown on plans regardless of that manufacturer's "product standards".
   02 To be considered for acceptance, provide the following:
      a. Company data and other information to support acceptance.
      b. Evidence that company has been in the primary business of casework manufacturing for a minimum of five (5) years.
      c. Return a copy of this Specification with each item / paragraph initialed to signify compliance. Where deviation of any item is proposed, fully described the item proposed.
      d. Provide a sample cabinet reflective of what is proposed to be furnished.

D. Plastic Laminate: Refer to Drawings for specific plastic laminate finish selections. The following manufacturers are acceptable to provide plastic laminate, provided the proposed products meet the color, pattern and finish of the plastic laminate finishes scheduled on the Drawings:
   01 Wilson Art
   01 Formica
   02 Nevamar
   03 Sterling Products, Inc.,Pionite Division

E. Hardware: The following manufacturers are acceptable to provide casework hardware:
   01 Olympus
   02 EPCO
   03 Julius Blum
   04 Knape & Vogt
   05 National
   06 Stanley
   07 Olympus

2.2 GENERAL

A. Drawings and Specifications are based upon casework as manufactured by TMI Systems Design, fixed modular casework.

B. Manufacturers requesting approval shall submit evidence of at least five (5) years of experience and installations for similar type of project. Manufacturers shall also provide catalogs and Specifications. Catalogs and Specifications shall be submitted with written request along with detailed list of compliance and deviations from these Documents for approval.

C. In addition to the above requirements, manufacturers requesting approval shall, at the same time, submit certified product test data in accordance with ANSI A161.1-1980, NEMA LD3-2000, and general static load testing performed and certified by an independent testing agency, covering the following areas of product performance, with these minimum results:
   01 Base cabinet construction/racking test: 800 lbs.
   02 Cabinet front joint loading test: 425 lbs.
   03 Wall cabinet static load test: 2,000 lbs.
   04 Drawer front joint loading test: 600 lbs.
   05 Drawer construction/static load test: 750 lbs.
   06 Cabinet adjustable shelf support device/static load test: 300 lbs.

D. The following performance details are project requirements and must be met by all bidders whether named herein, or approved by Addendum, regardless of that manufacturer's "Standards". Deviations will not be allowed.

01 Minimum Quality Standard: comply with AWI's Architectural Woodwork Quality Standards section 400 - Custom Grade for grades of interior architectural casework, woodwork, construction, finishes and other requirements; except as modified by this specification.

02 Cabinet Construction: All core materials shall be of an industrial grade, medium density particle board with non-formaldehyde binders. Board shall exceed performance requirements for ANSI A208.1-1999 M2 Standards.

03 Structural Cabinet Body: Cabinet backs shall be inset from rear of body, and fully bound (dadoed) four sides. Provide 3/4 inch (19.1 mm) thick stiffeners fastened to back/body as specified herein. Back perimeter shall be toe-nailed with mechanical fasteners for tight interior fit and direct connection of back panel to body and sealed with full-perimeter high-strength hot-melt adhesive.

04 Interior Structure: All cabinets over 36 inches (914 mm) wide shall be furnished with a mechanically fastened, yet removable, vertical divider to reduce horizontal member/shelf deflection. Wall cabinets shall have a clear inside nominal depth of 12 inches (305 mm) unless detailed otherwise.

05 Shelf Loading: Shelves shall meet the loading/deflection standards of the National Particleboard Association.

06 Structural Drawer Body: Drawer body shall be doweled with 1/2 inch typical bottom, recessed, fully bound (dadoed) and joint-glued all four sides. Provide under body stiffeners as specified herein.

07 Drawer Suspension: Drawer slides shall be self-closing design, with positive in-stop, out-stop, and out-keeper. Dynamic (operational) load rating shall be minimum 100 lbs. Minimum 150 lbs. static load rating.

08 Structural Cabinet Support: Cabinet sub-base shall be of a separate and continuous ladder-type platform design, leveled and floor mounted prior to cabinet body placement. Material shall be exterior grade plywood. No cabinet sides-to-floor will be allowed.

E. Architect / Owners opinion and decision shall be final in the evaluation of manufacturer's products for approval to bid or award of contract.

2.3 CORE MATERIALS

A. High Performance Core Material:

01 All core materials shall be an Industrial Grade particle board which shall meet or exceed performance requirements for ANSI A208.1-1999 M2 Standards.

02 All core materials shall be minimum 45 lb. density.

03 All core materials shall have a minimum 250 lb. screw holding capacity on the face plane and minimum 225 lb. screw holding capacity on the edge plane.

B. Cabinet components shall be of the following minimum core thicknesses:

01 Cabinet backs, drawer body, and drawer bottoms: 1/2" minimum.

02 Door and drawer face, base, tops (excluding countertops) and bottoms, cabinet sides, drawer spreaders, cabinet back rear hang-strips, structural dividers, exposed cabinet backs, and shelves up to 36" wide: 3/4" minimum.

03 Product-specific work surfaces, shelves over 36" wide and library stack shelving unless stack fitted with vertical divider: 1" minimum.

C. Marine Grade Plywood:

01 APA Grade A-A, made entirely of Douglas-fir or Western Larch.

02 All inner plies Grade B or better.

03 All glues and adhesives shall be waterproof.

04 Material shall comply with Voluntary Product Standard PS1-95 – Construction and Industrial Plywood.

2.4 LAMINATE MATERIALS

A. All laminates shall meet or exceed NEMA LD3-2000 standards; including thicknesses for stated laminate types / grades.

B. All lamination shall be performed with hybrid P.V.A. Type III water resistant adhesive.

C. Lamination System – Exposed Vertical Applications: Doors, finished end panels, and other vertical, exposed laminate surfaces shall be laminated with:
01 Minimum VGS – General Purpose grade laminate at .028” high-pressure plastic laminate. Color / pattern as selected by the Architect.
02 Balancing sheet shall be same grade and thickness as finished face laminate. Color at concealed locations shall be Contractor’s option.

D. Lamination System – Exposed Horizontal Applications: Countertops and backsplash exposed laminate surfaces shall be laminated with:
01 Minimum HGP – Postforming grade laminate at .039” high-pressure plastic laminate. Color / pattern as selected by the Architect.
02 Balancing sheet shall be same grade and thickness as finished face laminate. Color at concealed locations shall be Contractor’s option.

E. Lamination System – Exposed Horizontal Applications: Cabinet tops (other than countertops) and bottoms, drawer and shelf components exposed laminate surfaces shall be laminated with:
01 Minimum VGS – General Purpose grade laminate at .028” high-pressure plastic laminate. Color / pattern as selected by the Architect.
02 Balancing sheet shall be same grade and thickness as finished face laminate. Color at cabinet interiors shall match cabinet liner color as selected by the Architect.

F. Lamination System – Concealed Cabinet Backs and Ends: Concealed backs and ends of cabinet boxes that are finished with a 0.020” interior cabinet liner shall be minimum BKL – Unfinished Backing Sheet at 0.020”.

G. All lamination shall be performed with hybrid P.V.A. Type III water resistant adhesive.

H. Laminate color selections:
01 Standard laminate finishes as indicated or scheduled on the Drawings.
02 Provide chemical resistant laminates at science room(s)
03 Direction of wood grain shall be vertical on door, end panels, fascia panels, and exposed backs and ends; horizontal on drawer faces, aprons, and top rails.
04 Exposed cabinet interiors not concealed by doors shall be a laminate as selected by the Architect.
05 Unless otherwise noted, cabinet interiors concealed by doors shall be white.

2.5 EDGING MATERIALS

A. Edging types. Provide one or more of the following in accordance with "Edging Locations":
01 3 mm thick PVC: Solid, high-impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.

02 Flat Edge PVC: .020 inch (.51 mm). Solid, high-impact, purified, color-thru, acid resistant PVC edging, machine-applied with hot melt adhesives, automatically trimmed face, back and corners for uniform appearance. Manufacturer's option of .030 inch (.76 mm) high-pressure plastic laminate if matching PVC is unavailable.

B. Edging Locations. Provide the above specified edging types at the following locations, of the following colors:
01 Door/Drawer-Front edging: 3mm PVC color matched to standard laminate.
02 Cabinet body edge, including door/drawer front spacer rail: Flat Edge PVC, color matched to door / drawer face or as selected.
03 Forward edge of interior body components, interior dividers, shelf, and top edges of drawer body: Flat Edge PVC to match cabinet interior surface color.

2.6 DETAILED REQUIREMENTS FOR CABINET CONSTRUCTION:

A. Base Cabinet Sub-Base:
01 All base cabinets shall be mounted on sleeper sub-base assemblies completely separate from the cabinet body.
02 Vertical cabinet body components extending to the floor shall not be accepted.
03 Cabinet sub-base shall be continuous and separate from base cabinets. Individual sub-bases attached to each base cabinet box shall not be accepted.
04 Sub-base assemblies shall be fabricated from minimum 1-1/2” thick components, using one or more of the following materials / assemblies:
a. CCA / QCA treated 2x SYP materials.
b. CCA / QCA treated 1x SYP materials.
c. Marine grade plywood.
05 Sub-base shall be ladder-type construction of individual front, back, ends and intermediates, to form a secure and level platform to which base cabinets attach.
a. The front of sub-base shall be a single continuous member wherever possible; and where not possible due to the length of the base cabinet bank, shall have joints at not less than 96” apart.
06 Provide plastic shims as required to level the sub-base along its entire length.
07 Sub-bases at exposed cabinet end panels shall be recessed 1/4 inch from face of finished end, facilitating flush installation of finished base material by other trades.

B. Cabinet Top and Bottom:
01 Solid sub-top shall be furnished for all base and tall cabinets.
02 At cabinets over 36 inches, bottoms and tops shall be mechanically joined by a fixed divider.
03 Exposed wall cabinet bottoms shall be Pressure Fused white laminate. Assembly devices shall be concealed on bottom side of wall cabinets.

C. Cabinet Ends:
01 Exposed exterior cabinet ends shall be laminated with high-pressure plastic laminate, balanced with high-pressure cabinet-liner interior surface.
02 Holes drilled for adjustable shelves shall be 1-1/4” on center to within 6” of top and bottom of cabinet.

D. Cabinet Backs:
01 Cabinet back shall be fully bound (dadoed) into sides, top frame, and bottom, recessed 7/8 inch from cabinet rear.
02 Back shall be secured to cabinet body with mechanical fasteners and solidified with a continuous bead of industrial grade hot melt adhesive.

03 Hang rails shall be located at rear of cabinet back and fastened to cabinet sides.
a. Provide minimum of 2 at base cabinets, 2 at upper wall-hung cabinets, and 3 at tall cabinets.
04 Exposed exterior backs shall be high-pressure plastic laminate balanced with high-pressure cabinet-liner.

E. Door and Drawer Fronts:
01 Drawer fronts and hinged doors shall overlay the cabinet body.
a. Maintain a maximum 1/8 inch reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
02 Laminated door and drawer fronts shall be 13/16 inch thick to provide a flush / on-plane appearance.
03 Stile and rail doors shall be 13/16 inch thick with full 1/4 inch plate glass.
a. To be hinged or sliding as indicated on the Drawings.
b. All exposed lite-opening edges shall be trimmed and glazed with extruded glazing bead.
04 Frameless sliding glass doors shall be 1/4 inch thick clear, laminated safety glass with ground and polished edges. See Paragraph 2.8 HARDWARE for frame and rollers.

F. Drawers:
01 Drawer fronts shall be ¾” thick core with plastic laminate applied to separate drawer body component sub-front.
02 Drawer sides shall be ½” thick doweled and glued to receive front and back, machine squared and held under pressure through final set.
03 Drawer bottom shall be fully bound (dadoed) into front, sides, and back. Routing, in drawer body for bottom, shall receive continuous glue.
04 Reinforce drawer bottoms with 1/2 inch x 4 inch intermediate underbody stiffeners, mechanically fastened, run front to back.
a. Drawers less than 24” wide do not require stiffeners.
b. Provide one stiffener at drawers 24” to 35” wide.
c. Provide two stiffeners at drawers 36” to 48”.
05 Drawers to be used for flat paper storage shall be fitted with a 6” deep, full width hood at back of drawer.

G. Fixed and Adjustable Shelves:
01 Thickness shall be 3/4" for units up to 36” wide.
02 Thickness shall be 1” for units wider than 36”.

H. Vertical and Horizontal Dividers: One of the following as indicated on the Drawings or by cabinet number:
01 Natural hardboard 1/4" thick, smooth both faces. Secure in cabinet with molded plastic clips.
02 Plastic laminate clad, 1/2" or 3/4" thick core material. Sub-dividers shall be secured in cabinet with molded plastic clips or dowels.
03 Structural dividers in cabinets over 36” wide shall be secured in cabinet with mechanical euro fasteners.

I. Door / Drawer Front Rail: Provide minimum 3/4" x 6” x full width cabinet body rails immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, close off reveal, and be locator for lock strikes.

J. Countertops:
01 High-pressure plastic laminate .050” thick bonded to core. All countertops shall be medium density particle board 1 ¼” thick, except countertops within 36” of a sink shall be 1 ¼” thick marine grade veneer plywood.

02 Core thickness: 1-1/4”. Underside shall be fully balanced with equal thickness balancing / backing sheet.
03 Back-splashes and end-splashes shall be 3/4" x 4” unless shown otherwise on the Drawings. Face and top of splashes shall be plastic laminate clad to match countertops, balancing sheets on concealed sides.
04 Furnish countertops with edge treatment, backsplash and design profile as indicated on Drawings.
05 Provide tops in as long as practical continuous lengths. Provide field glued splines at joints.
06 No countertop or plastic laminate joints closer than 24” either side of sink cutout.
07 Mobile cabinet tops shall be high-pressure plastic laminate on exterior and high-pressure cabinet-liner on underside. Edges shall be high-impact 3 mm PVC.

2.7 WORKMANSHIP

A. All exposed exterior cabinet surfaces shall be thicknesses specified, high-pressure laminate, color as selected by the Architect.
01 Laminate surface / balancing liner to core under controlled conditions by approved and regulated laminating methods to assure a premium lamination.
02 Natural-setting hybrid P.V.A. Type III water resistant adhesives that cure through chemical reaction, containing no health or environmentally hazardous ingredients, are required. Methods requiring heat are not allowed; "contact" methods of laminating are not allowed.

B. Cabinet parts shall be accurately machined and bored for premium grade quality joinery construction utilizing automatic machinery to insure consistent sizing of modular components. End panels shall be doweled to receive bottom and top.

C. Back panel shall be fully bound (dadoed) into, and recessed 7/8” from the back of cabinet sides, top, and bottom to insure rigidity and a fully closed cabinet. Cabinet back shall be mechanically fastened from rear of body for tight interior fit and sealed with full-perimeter high-strength hot-melt adhesive.

D. Drawer bottom shall be fully bound (dadoed) and glued into and recessed 1/2" up from the bottom of sides, back, and sub-front. Sides of drawer shall be doweled to receive drawer back and sub-front.

E. 3/4 inch thick hang rails shall be mechanically fastened to end panels of all wall, base, and tall cabinets for extra rigidity and to facilitate installation.

F. All cases shall be square, plumb, and true.

G. Case body and drawer workmanship and quality of construction shall be further evidenced by Independent Testing Laboratory results.

H. Provide removable back panels and closure panels for access plumbing behind cabinet at all sink base cabinets, and where shown on Drawings. Not applicable at base cabinets where water supply and sanitary is directly routed into a CMU back up wall.

I. ADA, Americans with Disabilities Act Requirements: The following special requirements shall be met, where specifically indicated on Architectural Plans as "ADA", or by General Note. Shall be in compliance with Federal Register Volume 56, No. 144, Rules and Regulations:
01 Countertop height: With or without cabinet below, not to exceed a height of 34” A.F.F. (Above Finished Floor) at a surface depth of 24 inches.

02 Knee Space Clearance: Provide a minimum of 29” A.F.F. at apron, and minimum 30” clear span width. Typical at sinks that are open below.

03 At sinks open below, provide a 3/4" x full width, plastic laminate clad, removable panel in front of sink and plumbing piping. Panel shall be attached to the adjacent base cabinet, both sides.

04 Sink cabinet clearances: In addition to above, upper knee space frontal depth shall be no less than 8”, and lower toe frontal depth shall be no less than 11” at a point 9” A.F.F., and as further described in Volume 56, Section 4.19.

05 12” deep shelving, adjustable or fixed: Not to exceed a range from 9” A.F.F. to 54” A.F.F.

06 Wardrobe cabinets: Shall be furnished with rod &shelf adjustable to 48” A.F.F. at a maximum 21” shelf depth.

2.8 HARDWARE

A. Hinges: Heavy duty, five-knuckle, 2-3/4” institutional type hinge shall meet ANSI/BHMA A156.9 Grade 1 requirements. Design is based on Stanley Hardware No. 351490, class 1592 Interleaf Casework Hinge, or approved equal.

01 Mill ground, hospital tip.

02 Hinge shall be full wrap around type of .088” thick tempered steel.

03 Each hinge shall adjustable in both vertical and lateral directions to assure positive door attachment and alignment.

04 Provide one pair per doors up to 48-inch height; and one and one-half pair on doors over 48” in height.

05 Hinge shall accommodate 13/16” thick laminated door and allow 270 degree swing.

06 Finish shall be 26D satin chromium plated finish.

B. Pulls: Wire design, solid brass, 4” x 1-5/16” projection. Design is based on EPCO MC402-4-BRC; or approved equal.

01 Finish shall be 26D satin chromium plated finish.

C. Locks: Refer to spec section 08 71 00 – Finish Hardware

D. Standard Drawer Slides:

01 Standard Drawers: Full extension, telescopic, self-closing design, steel ball bearing operation with positive in-stop, out-stop. Design is based on Knape & Vogt # 8417; or approved equal.

02 Minimum 100 lb. dynamic load rating. Electro-zinc plated with lacquer top coat.

E. File Drawer Slides:

01 File Drawers: Full extension, 3-part progressive opening slide on precision steel ball bearings; minimum 100 lb. dynamic load rating; hold-in feature to prevent bounce-back; positive in / out stops. Design is based on Knape & Vogt # 8500; or approved equal.

02 Provide integral, body mounted molded steel rails for hanging file system for legal and letter file drawers. Cutting or machining of drawer body / face is not allowed.

03 Provide electro-zinc plated with lacquer top coat.

F. Catches: Catch shall provide opening resistance in compliance with the Americans with Disabilities Act.

01 Non-Locking Doors: Provide top-mounted magnetic catch for base and wall cabinet doors. Provide two at each tall cabinet door. Design is based on EPCO no. 592; or approved equal.

02 Locking Pair of Doors: Furnish an elbow catch on the door leaf not receiving a lock. One required on doors up to 48 inches tall and two required (top and bottom) on doors over 48 inches tall. Design is based on EPCO no. 1018; or approved equal.

G. Adjustable Shelf Supports: Twin pin design with anti-tip-up shelf restraints for both 3/4" and 1" shelves.
01 Design shall include keel to retard shelf slide-off, and slot for ability to mechanically attach shelf to clip.
02 Load rating shall be minimum 300 lbs. each support without failure.
03 Cabinet interior sides shall be flush, without shelf system permanent projection.

H. Sliding Glass Door Hardware:
01 Framed Assembly Sliding Doors: Design based on EPCO Assembly 16 (modified to #730 head / jamb track), complete for the intended installation; or approved equal.
02 Provide continuous top and jamb tracks, continuous glazing shoes, track base with double track, and rollers.
03 Provide sliding Glass Door Lock: Ratchet type lock. Design is based on EPCO G05 series locks; or approved equal.

I. Wardrobe Rod: Shall be 1-1/16" rod, supported by flanges both sides, chrome finish; or equal.

J. Coat Hooks:
01 Single prong coat hooks, ceiling mount. Satin finish.
02 Double prong coat hooks, ceiling mount. Satin finish.

K. Grommet:
01 Design is based Doug Mockett & Co. Model "XG", 3" diameter, round grommet with flip top series; or approved equal.
02 Provide one (1) grommet at each non-plumbing knee space with power and data below countertop.

L. Fasteners:
01 All fasteners shall be of such type and length to withstand a minimum pull-out force of 200 LBS.
02 All screw fasteners shall extend a minimum of 67% into the substrate it is being used on.
03 Screw fasteners shall be countersunk type at all hardware fabricated to accept countersunk screws.
04 All screw fasteners shall be cadmium plated or stainless steel.
05 All screws seated directly against a cabinet panel shall be provided with appropriately sized washers.

2.9 SPECIAL MATERIALS

A. Glass:
01 Glass for framed and unframed doors shall be 1/4" thick clear laminated safety glass, complying with ASTM C1172, Kind LT, Condition A, Type 1, Class 1.
02 Glass used in fume hood sashes or other equipment used in hazardous areas shall be 1/4" thick laminated safety type glass, complying with ASTM C1172, Kind LT, Condition A, Type 1, Class 1.
03 Fluorescent light shielding in fume hoods shall be tempered glass offering greater resistance to heat and impact.

PART 3 - EXECUTION

3.1 INSPECTION

A. Carefully inspect all casework upon delivery. All units damaged upon arrival shall be returned to the manufacturer for repair and / or replacement.

B. Any / all units which do not have required balance sheets on concealed surfaces shall be returned to the manufacturer for repair and / or replacement. Field application of balance sheets shall not be allowed.

C. Leave protective shipping materials in place until casework is delivered to its final room destination. Use all means necessary to protect adjacent work during transit and installation in the building.

3.2 PREPARATION

A. Coordinate with other trades as required for proper installation of blocking in walls, etc. for secure attachment of casework. Verify exact field installed locations.

B. Inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence. Closely inspect the squareness and flatness of walls behind cabinets to facilitate a tight, even fit of casework to wall. Coordinate with other trades as required for corrective prep work.

C. Inspect conditions at floor slabs for proper installation of cabinet sub-bases. Coordinate with other trades as required for corrective prep work.

D. Verify rough plumbing and electrical work is properly located to permit casework, fixtures and equipment to be installed in strict accordance with the original design, pertinent codes, and regulations, and reviewed Shop Drawings.

E. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until such discrepancies have been resolved.

3.3 INSTALLATION

A. Casework base cabinet components / boxes shall be assembled in the configurations and locations as indicated on the Drawings.
   01 Securely anchor base cabinets to sub-base and through back to wall blocking at top of casework.
   02 Securely fasten casework base cabinets through sides to adjacent base cabinet(s).
   03 In as much as practical, standardize fastener locations at each cabinet to maintain a uniform appearance.

B. Casework upper wall cabinet components / boxes shall be assembled in the configurations and locations as indicated on the Drawings.
   01 Wall cabinets shall align with base cabinets unless specifically shown otherwise on the Drawings.
   02 Securely anchor upper wall cabinets through back to wall blocking at top and bottom of each cabinet.
   03 Securely fasten casework upper wall cabinets through sides to adjacent upper wall cabinet(s).
   04 In as much as practical, standardize fastener locations at each cabinet to maintain a uniform appearance.

C. Provide matching fillers and scribes to fit cabinets to partitions, columns and other adjacent interfacing work. At wall-to-wall conditions, center cabinets for equal fillers / scribes each end.

D. Provide closure panels at top and bottom of upper wall cabinets at blind corner and similar locations.

E. Verify lengths of countertops, splashes, and sub-bases. Provide in longest practical lengths to minimize splices in plastic laminate. Securely fasten countertop to each base cabinet from the underside through the top of the base cabinet.

F. Provide back-splashes and end-splashes wherever a back or end is adjacent to a wall, whether shown or not.

G. Plumbing and electrical items shall be furnished under the Plumbing and Electrical Section.
   01 Installation of work furnished by the various trades shall be coordinated to assure properly functioning equipment at the completion of the job.
   02 The casework supplier shall be responsible for all cutouts necessary to receive plumbing items. Provide 'J' clamps to secure sinks to countertops.

H. Seal all joints in countertops, splashes and walls continuous with clear acrylic sealant.

3.4 ADJUSTMENT

A. Doors:
   01 Upon completion, adjust all doors / hinges to be hung plumb and square, resulting in a consistent gap between pairs of doors at +/- 1/8".
   02 Verify that magnetic catches and latches are positioned correctly to hold door in tight, fixed position. Adjust as required.

B. Drawers:
   01 Upon completion, adjust all drawers to function easily and smoothly, without binding or shimmying.
   02 Verify that drawers with automatic closing hardware function properly.

C. Locks:
   01 Verify all proposed locations with Architect prior to commencement.
   02 Verify locks in each room / area are keyed in accordance with the Owner's standards and direction.
   03 Install locks in cabinets as indicated on the Drawings or directed by the Architect.
   04 Provide stops, catches and similar hardware, properly placed to provide positive locking.
   05 Using cabinet body and similar components as stops / catches is prohibited.

D. Final Cleaning: Upon completion of all final adjustments, thoroughly clean all debris from cabinets; including, but not limited to: glue, sealant, pencil marks, saw-dust, wood shavings, loose hardware, smudges, dirt and other similar items.

END OF SECTION

SECTION 14 24 00

HYDRAULIC ELEVATORS

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide a holeless, 4500 lb hydraulic elevator as indicated on the Drawings, complete with cab, door frames & trim, interior finishes, controls and all other accessories required for a complete installation.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 04 20 00 – Unit Masonry
   03 Section 08 71 00 – Finish Hardware
   04 Section 09 21 16 – Gypsum Board Assemblies
   05 Division 26 – Electrical
   06 Division 27 - Communication

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.

02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3”, but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals:
01 Provide complete operations and maintenance manuals to the Owner.
02 Refer to section 01 78 23 – Operations and Maintenance Manuals
03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. American National Standards Institute (ANSI) / NFPA
01 ANSI A117.1 – Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
02 ANSI/NFPA 70 – National Electrical Code.
03 ANSI/NFPA 80 – Fire Doors and Windows.
04 ASME/ANSI A17.7 – Safety Code for Elevators and Escalators.
05 ANSI/UL 10B – Fire Tests of Door Assemblies.
06 EN 12016 (May 1998) – “EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity”
07 Local Building Codes.

B. National Electric Code – Latest edition with supplements

C. Americans with Disabilities Act (ADA)
01 ADAAG, Americans with Disabilities Act Accessibility Guidelines.

D. State of Texas Revised Civil Statutes, Article 601b, Article 7

1.4 WARRANTY

A. The elevator contractor’s acceptance is conditional on the understanding that their warranty covers defective material and workmanship.

B. The warranty period shall two (2) years from the date of Substantial Completion.

C. The warranty shall cover
01 All operating components.
02 All cab components furnished and installed by the elevator manufacturer.
03 All communication and electrical components furnished and installed by the elevator manufacturer.

1.5 MAINTENANCE

A. Provide regular examinations to maintain all equipment in satisfactory operations, and to perform supply adjustments, greasing, oiling, cleaning, parts and other services necessary for proper performance.
01 Work made necessary by Owner’s misuse, accidents, negligence, or lack of maintenance after maintenance time expires is not required.

B. Provide a maintenance program for two (2) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design of the elevator is based on products manufactured by Thyssen Krupp Elevators.

B. The following manufacturers are acceptable provide proposed products meet or exceed all specified requirements and fit designed spaces available as indicated on the Drawings.
   01 Shindler Elevator Company

C. Any supplier requesting approval shall have a minimum of five (5) years' experience in the installation of similar equipment, and have a maintenance representative in the area with parts stocked.

2.2 MATERIALS

A. Design of elevator is based on Thyssen Krupp Elevators Endura Holeless passenger elevator.

B. Power supply for the elevator apparatus will be as shown on the Electrical drawings.

C. Elevator shall be "plunger-electric" with direct acting plunger, pumping unit, storage tank, magnetic control valves, and the following:
   01 Pumping units and associated control equipment shall be located in a machine room remote from the hoist-ways.
   02 Operating fluid shall be oil.
   03 Pumps shall deliver oil directly into the cylinders at the necessary pressure and in sufficient quantity to lift the fully loaded elevator at the specified speed.
   04 The tank shall act as a storage tank only, and the oil shall be pumped from the tank into the cylinder on the up trip, returned to the tank on the down trip.

D. Attributes shall include:
   01 Capacity: 4,500 lbs. exclusive of weight of car and plunger, Class A.
   02 Speed: Minimum 80 feet per minute.
   03 Number of Upper Floor Stops: One
   04 Travel Distance Between Floors: +/- 15'-0" each.
   05 Openings: Front at ground and second floors.
   06 Door Operation: Automatic microprocessor controlled direct current powered.
   07 Clear Car Inside: 5'-8" width x 7'- 9½" depth
   08 Operation: Single car - DMC - 1
   09 "Oildraulic" controller
   10 Door Opening: 4'-0" wide x 7'-0" high entrance, center-biparting-slide opening with factory-finished enamel. (See drawings)
   11 Signals to be position indicator in car, "light-up" operating buttons.
   12 Features:
      a. ThyssenKrupp Endura cab, stainless steel front with swing panel, Stainless steel jambs and header, with stainless steel kick plate, telephone compartment with phone, car position indicator, emergency light and alarm bell, Owner provided porcelain tile flooring, oil line shutoff valve, jack cylinder wrapped with corrosion-resistant protective tape, sound isolation couplings, "Oildraulic" silencer, NEMA 1 (fully enclosed) controller cabinet.
      b. Emergency Service in accordance with the Safety Code for Elevators and Escalators (ANSI/ASME A17.1) is included.

c. Elevator dimensions, location of car operating station, controls, signals, telephone compartment and handrail comply with the requirements of ANSI and NFPA A117.1 ADA, Texas Civil Statues and the City of La Porte Building Code for use by the physically handicapped.

d. Other features that may be required by Texas state and local elevator codes shall be included, such as electronic door sensing device, visual and audible signals, hall lanterns, gongs, handicapped signal and control package, and tactile markings.

e. Cab dimensions shall be 7'-9-1/2" x 5'-8" inside clear.

13 Access: Provide keyed access switches and forty keys. Provide Sargent brand cylinder lock (7 tumbler) keyed to the Owner's master key system.

14 Electrical: 480V/3-Phase/20 HP/60 Hz

15 Provide a pit ladder.

16 Provide travel cables for cameras and telephone.

E. Finishes:

01 Floor: Furnished and installed by flooring contractor. Refer to Drawings for floor finish material.

02 Wall Panels: Plastic laminate wall panels mounted over prefinished steel panels finished in high performance baked on enamel finish.

03 Colors / finishes as selected by the Architect from Manufacturer's full range of standard finishes.

04 Ceiling: Acoustical lay-in ceiling furnished and installed by ceiling contractor.

2.3 CONTROLLER

A. Must be a full feature, non-proprietary universal controller.

01 Motion Control controller, or equal approved by the Owner.

B. A microprocessor-based controller shall be provided, including necessary starting switches together with all relays, switches, solid-state components and hardware required for operation, including door operation, as described herein.

C. A three (3) phase overload device shall be provided to protect the motor against overloading.

D. The controller shall be located together with the hydraulic system in the hoistway pit and be easily accessible for maintenance through the same access door that is also used for the hydraulic system.

E. A manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

2.4 HOISTWAY COMPONENTS

A. Plunger(s) and Cylinder(s): Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure.

01 The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing.

02 Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish.

03 Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder.

04 Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.

B. Car Guide Rails: Tee-section steel rails with brackets and fasteners.

C. Polyurethane type buffers shall be used.

D. Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.

E. Hoistway Entrances
   01 Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
   02 Sills shall be extruded Aluminum.
   03 Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
   04 Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour
   05 Entrance Finish: Satin Stainless Steel
   06 Entrance marking plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
   07 Sight Guards: Black sight guards will be furnished with all doors.

2.5 CAR COMPONENTS

A. Cab**:** Steel shell cab with raised laminate panels. Laminate to be selected from standard manufacturer’s full range of options.
   01 Brushed Steel Finish finished base plate located at top and bottom.

B. Car Front Finish: Satin Stainless Steel

C. Car Door Finish: Satin Stainless Steel

D. Ceiling Type: Flush steel ceiling with 4 LED lights in a real white (EW0) finish.

E. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

F. Fan: A one-speed 120 VAC fan will be mounted to the structural ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

G. Handrail: Handrails shall be 3/8” x 2” (9.5 mm x 51 mm) flat tubular handrail with a brushed steel finish.

H. Handrails shall be provided on the rear of the car enclosure.

I. Threshold: Extruded Aluminum

J. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

K. Guides: Car roller type guides at the top and the bottom.

L. Platform: Car platform shall be constructed of metal.

M. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

2.6 MAINTENANCE

A. In addition to the required maintenance and protection during construction, provide maintenance on the entire work of this section for a period of 2 years commencing on the day of Substantial Completion. Maintenance shall include, but not necessarily be limited to:
   01 Systematic examination, adjustment, and lubrication of all elevator equipment.
   02 Repair or replacement of electrical and mechanical parts of the elevator installation as required, using only the genuine standard parts approved for the original installation.
   03 Maintenance work as required during regular working hours and regular working days, but with emergency callback service available at all times during this maintenance period.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate with Contractor / Construction Manager to participate in the review of shop drawings for the concrete foundation and structural steel.
   01 Verify all proposed concrete design and structural steel design is correct and as required for correct installation of the elevator.

B. Coordinate with other trades as required to confirm hoistway is properly constructed to meet all requirements for the proper installation of the elevator and support system.

C. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until satisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install the work of this section in strict accordance with the reviewed shop drawings, the original design, and all pertinent regulations and codes, anchoring all components firmly into position for long life under hard use.

3.3 TESTING

A. Upon completion of the installation, and as a condition of its acceptance, provide all necessary equipment and personnel and perform all tests required. Secure all required approvals from agencies having jurisdiction.

3.4 DEMONSTRATION

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use.
   01 Provide reviewed and accepted Operations and Maintenance Manual to Owner prior to Owner demonstration.
   02 The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 21 13 13
FIRE SPRINKLER SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide all piping and equipment shown on the drawings, and all accessories necessary for a complete operating system.

B. System design and installation shall comply with the requirements of Texas State Fire Marshal's Office, NFPA 13, NFPA 14 and other applicable NFPA codes, FM/UL approving agencies, State Board of Insurance requirements, Owner's Facility Design Guidelines and requirements of the local authorities having jurisdiction.

C. Piping shall not be installed over electrical panels, electrical/technology equipment or transformers. Piping shall not be installed through dedicated electrical, or technology equipment rooms. Piping shall not be installed beneath HVAC equipment under any circumstance or adjacent to HVAC equipment where it restricts full service access to equipment.

D. All piping through walls (interior and exterior) shall be sleeved with Schedule 40 galvanized piping and sealed per Detail on Plumbing Drawings. All piping through fire walls shall be sealed to meet a UL listed assembly with approved material.

E. All piping shall be manufactured in the United States of America by Bull Moose Tube, Wheatland Tube or Allied Tube. All piping shall be labeled by manufacturer along entire length of pipes. Labeling shall indicate SIZE, CLASS, MATERIAL SPECIFICATION, NAME OF MANUFACTURER and COUNTRY OF ORIGIN. Piping not properly labeled by manufacturer with the information listed above will be removed from site and replaced at no cost to Owner. Piping and fittings shall be protected at all times. Piping and fittings resting directly on the ground is NOT acceptable. Provide temporary end caps and end closures on all piping and fittings. Piping found unprotected will be replaced by the Contractor at no additional cost to Owner.

F. Provide painting, pipe markers and valve tags per Section 22 05 53 of the Specifications.

G. System shall be included in the Coordination Drawings. See Section 22 01 00 of the Specifications.

H. Fire Sprinkler Contractor to provide own water supply hydrant flow test to verify water supply flow and pressure available.

I. See Fire Protection Standpipes section 21 13 13 and Fire Pumps section 21 30 00 for additional requirements.

PART 2 – MATERIALS AND METHODS

2.01 GENERAL

A. Engage the services of a sprinkler subcontractor who will perform detailed hydraulic calculations and system design to meet the design requirements as noted on the drawings. The subcontractor shall also furnish and install all equipment and piping according to his approved design. He shall provide all labor, scaffolding and equipment necessary for the performance of this work. Sprinkler Contractor shall also have a Licensed Engineer (PE - State of Texas) on staff to perform their fire sprinkler system design and hydraulic calculations. This Engineer shall be the Engineer of Record for the fire sprinkler and standpipe systems. **All fire sprinkler drawings and hydraulic calculations provided by the fire sprinkler contractor shall be sealed and signed (State of Texas Engineer's Seal – RME stamp is not sufficient) by the aforementioned Licensed Professional Engineer – submittal will be REJECTED by LTY otherwise.**

2.02 SCOPE OF WORK

A. The connection to the water main, fire vault and associated backflow preventer, isolating valves, supervisory switch, fire department connection and post indicating valve, and piping to the building are specified on the civil engineering drawings.

B. In location shown on drawings, install system riser including O S & Y valve, check valve, alarm valve, water motor alarm, retarding chamber and, water flow sensor. Where code authority requires, provide wall mounted PIV's for each fire sprinkler zone/system. Provide fire department test valves at appropriate places with approval of the Engineer. Piping for test valves shall not be exposed in any location unless in a mechanical room.

C. Install new fire sprinkler system with sprinkler branch piping and sprinkler heads in all areas of the building.

D. All fire sprinkler piping and equipment shall be labeled for identification according to the following requirements:

1. Data/Name plates shall be installed in accordance to Fire Prevention Bureau Standards.

2. Piping shall be identified in mechanical rooms, unfinished spaces without ceilings, above suspended lay-in acoustical ceilings, and crawl spaces for the type of service and direction of flow.

3. All fire prevention equipment shall be identified with data/name plates.

E. Fire sprinkler piping in all areas where piping is exposed to be view shall be installed tight to building structure. Coordinate accordingly.

F. All valves capable of disabling fire sprinkler system shall be installed with supervising switch tied to fire alarm. Including valves in site vault locations.

G. All sprinklers and piping provided under stair cases to be concealed or tight to stair case framing.

H. Sprinkler systems installed in exposed areas to be installed tight to structure.

2.03 EQUIPMENT AND MATERIALS

A. SPRINKLERS: Provide concealed sprinkler in all areas with ceilings. Install chrome plated, upright type in mechanical rooms or other rooms with no ceiling. Similar style, extended coverage or quick response heads are also acceptable. All sprinkler heads installed in ceiling tile shall be centered in the tile. Provide heavy-duty UL Listed, mechanically fastened, red metal guard to protect sprinkler heads from abuse or tampering on ALL exposed heads, including in mechanical and electrical rooms, ThreadGuard 201686 (no substitutions). Upright heads shall be chrome plated, brass construction and installed a minimum of 6” below overhead structure, ducts, etc. Fusible links shall have a temperature rating of a minimum of 50° F normal ambient temperature, 145° F minimum.

B. ALARM VALVES: UL approved alarm check valve complete with necessary trimmings, including electric alarm bell as shown on the drawings. Provide supervising switch on interior O S & Y valves for fire alarm interconnection.

C. VALVES AND DEVICES: All sprinkler control valves, alarm check valves, check valve and accessories shall be UL listed and FM approved. 2” and smaller shall be bronze, rising stem, inside screw with solid wedge. Larger valves shall be iron body, bronze trim, rising stem, OS&Y with solid wedge. Check valves shall be cast iron flanged body, bronze fitted, non-slam type. Acceptable manufacturers include Nibco, Tyco, Grinnell, Stockham and Victaulic.

D. PIPING BELOW GRADE: UL/FM listed PVC Class 200 water pipe installed in accordance with the manufacturers recommendations. Provide tracer wire for all underground piping with leads located in accessible area.

E. PIPING ABOVE GRADE: Schedule 40 or heavier, black steel with screwed or Victaulic joint complying with NFPA 13. Thinwall pipe is not acceptable. For every sprinkler head (including end of line sprinkler head), tap main/branch pipe serving each individual sprinkler head on top of pipe to prevent trash from collecting at head. Main or branch pipe shall extend 24” beyond the last sprinkler head tap. For all sprinkler heads except upright type, install swing joint (hard pipe return bend) over to sprinkler head location. All sprinkler heads installed in ceilings shall be centered in tile. Saddle taps are not acceptable. Where piping is exposed such as in stairwells it shall be installed tight to structure and a minimum of eight feet above the floor. All piping shall be manufactured in the United States by Bull Moose Tube, Wheatland Tube or Allied Tube. Braided stainless steel high performance U.L. listed and FM Approved flexible sprinkler head connections manufactured by Victaulic or Viking shall be acceptable to use provided flex connection tap is located on top of main/branch pipe serving flex connection. Where flexible sprinkler head connections are used, provide ceiling bracket assembly from same manufacturer as flexible sprinkler head connection at each sprinkler head that utilizes a flexible connection.

F. FITTINGS: Threaded for 2" and smaller and schedule 40 steel with grooved fittings for sizes larger than 2". Threaded fittings shall be Class 150, malleable iron, manufactured in USA (Anvil is an acceptable manufacturer). Grooved fittings shall be Schedule 40 steel joined with Victaulic style 005, 009, 07, 75, or 77 couplings and Grade "E" gaskets. For outlet fittings, Victaulic reducing couplings/fittings and outlet couplings shall NOT be used - use welded outlet fittings (Anvil is an acceptable manufacturer). Welded joints on pipe runs shall be made with continuous welds and with pipe ends beveled BEFORE fabrication. A hole cutting tool shall be used (Do

NOT burn holes in pipe). Grooved piping shall be roll grooved. All fittings shall be UL listed and FM approved for fire sprinkler systems. Size on size will only be permitted where in compliance with UL listing and FM approval. No sprinkler branch tap connections, tees, cross outlets with female threaded or grooved couplings that require hole drilling of main piping will be allowed. No Victaulic 920 or 920N style mechanical tees or similar style tees will be allowed.

G. MISCELLANEOUS PIPING: Piping exposed to view outside such as drain and test piping shall be chrome plated and installed so as not to be a pedestrian hazard or stain building.

H. SIGNS, LABLES AND IDENTIFICATION: Furnish metal signs in accordance with NFPA 13. Provide placards on all control valves, alarm lines, alarm test lines, floor control valves, area control valves, inspector test valves and auxiliary drain locations. Valves, etc. above ceiling or in walls to be provided direct access and the location conspicuously noted by a permanent placard indicating the type of device and the zone it covers. Provide a zone map, mounted in an extruded metal frame with protective plexi-glass cover mounted at the sprinkler zone valve header. Map shall indicate which zone valve controls which portion of the building as well as the location of all system drain and test valves. Label each valve with lamacoid, printed signs (“Inspector’s test”, “Main Drain”, etc.). Map shall reflect the actual room numbers indicated in the final approved graphics package.

I. ACCEPTABLE PIPING MANUFACTURERS: Bull Moose Tube, Allied Tube or Wheatland Tube. All piping and fittings shall be manufactured in the United States.

J. ACCEPTABLE ACCESSORY MANUFACTURERS: Grinnell, Reliable, Tyco, Victaulic and Viking (All equipment such as retarding chamber, valves, sprinkler heads, alarms and similar items shall be from the same manufacturer.)

2.04 PIPE SUPPORTS

A. GENERAL: Provide pipe supports and guides of size and type to support pipe as well as limit movement. Minimum size hanger rod shall be 3/8”. Piping connected to a piece of equipment shall have a support located near enough to the equipment that there will be no pipe weight supported by the equipment. In no case shall the nearest support be more than two feet horizontally from the connection point. Pipe support material shall be selected to be compatible with the pipe material to prevent galvanic corrosion. Un-insulated copper piping shall be wrapped with gas wrap tape at each hanger (minimum 2” beyond hanger), and supports shall be hot dipped copper clad or plastic covered. Vertical pipe shall supported per the manufacturers recommendations.

B. HORIZONTAL PIPING:

1. SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than below:

Pipe Size	**Steel Pipe**	**Other Pipe**
1" & Smaller	6 Feet	4 Feet
1¼" & 1½"	8 Feet	5 Feet
2"	8 Feet	5 Feet

2½" to 4"	8 Feet	6 Feet
6" and Larger	8 Feet	6 Feet

2. SUPPORT FROM ABOVE: Support piping near roof or upper floor from structure if sufficient strength exists. Use a method suitable for type of construction and of sufficient strength. Use threaded steel hanger rods of diameter required to safely support loads. Minimum size hanger rod shall be 3/8”. Install rods through holes drilled in beam flanges, 1½" x 1½" x 8" angles welded to structural members or top cord slot at joist panel points and secure with large washers and nuts. Refer to structural drawing details for additional information. Do not use perforated strap. ***CONCRETE ANCHORS SHALL NOT BE USED.***

3. HANGERS: Manufactured by Anvil, Grinnell or Tolco.

   a. SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

   b. MULTIPLE RUNS: Trapeze hangers.

   c. BEAM CLAMPS: Grinnell Figure 92 for smaller pipe

   d. BEAM CLAMPS: Grinnell Figure 228 (storm or sanitary 8” and larger)

4. SUPPORT FROM BELOW: All piping near the floor, or where ceiling structure does not have sufficient strength, or where there is no ceiling shall be supported from below. Support members shall be steel pipe with base plates, or welded steel structure suitably braced. Unless described by detail on the drawings, provide Tolco Pipe Pier Supports four foot on center to support piping on the roof. Select for proper weight loading.

5. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel.

6. PIPE SADDLES: Install 18 gauge, 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, 16” minimum length. Provide compressible gasketing between non-insulated plastic pipe and hangers. Provide insulating material between dissimilar metal.

7. SWAY BRACING: Piping shall be braced as necessary to prevent excessive movement of pipe due to water flow.

2.05 SYSTEM TESTING

A. All underground piping shall be thoroughly flushed in accordance with NFPA 13 and 24. The flush test shall be witnessed by the proper governing authority.

B. All underground piping shall be hydrostatically tested at 200 psi for a period of two hours. Comply with NFPA 13 and 24.

C. All above ground piping shall be hydrostatically tested at 200 psi for a period of two hours. All piping, valves and sprinkler heads shall be water tight.

D. Provide inspector's test connection at all test points. Provide and install AGF model 1000 test and drain. Drain/test valves shall be located out in the system piping, not at the building service entrance (i.e. building fire sprinkler riser). All drain/test stations shall be clearly shown by subcontractor on design drawings submitted to Owner and LTY for approval. Failure to show drain/test station locations will result in immediate rejection of submittal without further review. No piping or access for drain/test stations shall be installed in finished rooms. Discharge for drain/test stations shall drain to grassy areas – do not discharge onto concrete sidewalks or drives.

E. All testing shall be subject to the guidelines outlined in 22 00 00 – General Plumbing, Paragraph 1.24 – MEP INSPECTIONS section of the Specifications.

2.06 SPARES

A. Contractor to provide and install a baked enamel steel box to store up to 36 heads. Contractor to provide minimum of six (6) of each type of head used. Contractor to provide a minimum of six (6) additional sprinkler head wire guards. Contractor to provide one (1) of each type of sprinkler wrench. Contractor to provide a minimum of twelve (12) spare cover plates for concealed head sprinklers.

2.07 GUARANTEE

A. All materials and installation shall be guaranteed for one year from Owner's acceptance.

2.08 SUBMITTALS

A. Submit equipment, hydraulic design calculations and layout drawings for approval. Hydraulic Calculations and Layout Drawings shall be sealed and signed by the Licensed Engineers (State of Texas) on staff with the fire sprinkler contractor that performed the design and calculations. LTY will not review submittal unless sealed and signed by the fire sprinkler contractors Engineer. These drawings shall be approved by the applicable state and insuring agencies. Alternately, contractor may submit design drawings for preliminary approval prior to submitting to governing agencies. After agency approval, resubmit to architect for final approval.

B. Submittal drawing shall show the location of ductwork, mechanical equipment above the ceiling, ceiling devices, and other items that may cause conflict with sprinkler piping and sprinkler heads. Drawings shall indicate height of pipes not in mechanical rooms, and any pipe that cannot be installed above 8 feet shall be highlighted. Piping shall be coordinated with ductwork contactor and may require relocation due to mechanical/plumbing ductwork and piping constraints.

C. Submittal drawing shall show the location of all drain and test valves and piping discharge.

D. Provide a printed sheet giving brief instructions relative to all necessary aspects of sprinkler controls and emergency procedures next to sprinkler riser mains. Instruction shall be protected by glass or a transparent plastic cover. Provide zoning map of building framed and mounted at fire sprinkler riser.

E. Approval of these submittals shall not be construed as releasing the contractor from compliance with the contract Documents. They are a means of coordinating the work and aiding in the proper

selection and installation of equipment. Do not release items such as fire dampers and starters until associated equipment or ductwork drawings are approved. All materials and equipment shall be subject to final acceptance by the Engineer at the completion of construction and adjustments of the system.

F. If a submittal is returned to the Contractor marked “Rejected” or “Revise and Resubmit”, only one (1) additional submittal will be permitted without the Contractor incurring charges for the additional re-submittals. LTY shall be reimbursed by the Contractor for any expense in connection with any necessary submission in addition to the two (2) submissions allowed. Contractor will be billed by LTY a flat rate of $1,000 plus any additional expenses for each re-submittal that is in addition to the two (2) submissions allowed.

2.09 RECORD DRAWINGS AND CALCULATIONS

A. During the course of construction, the Contractor shall revise their design drawings and calculations to reflect any changes which are made. At completion of job, updated Design Drawings and Hydraulic Calculations that have been signed and sealed by the Contractor’s design engineer shall be included in the Operations and Maintenance Manual that the Contractor provides for the Owner when the project has been completed. Record drawings shall include exact installed locations of all piping, sprinkler heads, zone valves and drain/test valves. See Section 22 00 00 of the Specifications for additional requirements.

B. Provide zoning map of building framed and mounted at fire sprinkler riser.

2.10 CONSTRUCTION PHASING

A. Phasing of construction shall be the sole responsibility of the General Contractor. Construction phasing shall accommodate all needs and schedules required by the Owner. All costs for construction shall be included in the price submitted by the Contractor on the bid date. No additional money will be approved for the Contractor or their sub-contractors to accommodate costs (including labor) associated with construction phasing.

END OF SECTION 21 13 13

SECTION 22 00 00
GENERAL PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 INTENT OF DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications are intended to be complimentary. Any work exhibited in either of them whether in the other or not, is to be executed according to true intent and meaning thereof, the same as if set forth in all. Should any work required by the drawings and specifications be in violation of any Federal, State, County or City laws, ordinance or regulation, those laws and regulations shall prevail, and shall be complied with by the Contractor as a part of this work with no extra compensation.

B. The drawings are schematic in nature but show the various components of the system approximately to scale and indicate how they are to be integrated with other parts of the building. Determine exact locations by close coordination with the Owner's Representative, job measurements, determining the requirements of other trades and reviewing all contract documents. The Drawings indicated general routing of the various parts of the systems, but do not indicate all fittings, offsets and runouts which are required. The Contract includes these items as required to fit the system into spaces allotted for them.

C. Equipment that is scheduled is the basis of the design, and have been coordinated for space, installation and electrical requirements. Space, installation and electrical requirements for other equipment and models from acceptable manufacturers have not been verified or coordinated. Contractor shall verify these requirements prior to using other equipment in his bid and include any additional costs for installation of the equipment. This includes general construction and MEP costs.

1.03 PERMITS AND FEES

A. The contractor shall obtain and pay for all permits and licenses, file all notices, pay all legal fees and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work specified or shown on the drawings. This applies to Federal, State and Local Codes and Requirements. Approval to the various insuring and inspection authorities shall also be obtained. Refer to Architectural sections for additional information.

1.04 GUARANTEE

A. All materials, apparatus and equipment furnished and installed under this Section of these Specifications shall be new and free from any defects when accepted by the Owner and shall be guaranteed in writing for a period of one year from the date of acceptance by the Owner unless noted to have extended warranties.

1.05 COOPERATION

A. The Contractor shall cooperate with other trades on the job and make installations in the proper sequence during the construction of the buildings, and he shall notify the Architect well in advance of construction of all interference of his work with that of other trades and of building construction. This notification shall not relieve the contractor of his responsibilities.

1.06 VISITING THE SITE

A. The Contractor shall be familiar with the Drawings and Specifications and shall have examined the premises and understand the conditions under which he will be obligated to operate in performing the contract. No allowance shall be made consequently for any error through negligence in this regard.

1.07 WORKMANSHIP

A. All work shall be performed in a neat workmanlike manner and in the best practice of the trade. Only workmen skilled in the trades shall be employed to perform the work included in these specifications.

1.08 MATERIALS

A. Materials, when not otherwise definitely specified, shall conform to applicable National Specifications and Standards. All materials shall be certified to not contain any asbestos or other material banned by the Environmental Protection Agency. Lead shall not be used in any material, pipe or solder in contact with the domestic water system.

B. The names of manufacturers and model numbers have been used in the Contract Documents to establish type of equipment and standard of quality. Where only one name is mentioned for a particular item of material, then that manufacturer is the only one acceptable. Where several names are mentioned, any one of those listed may be furnished provided submittal contains sufficient information to show complete compliance with contract Documents. No attempt has been made to determine if each manufacturer listed will produce material that will comply with all requirements of this project or will fit the allotted space; if they do, then it will be acceptable.

C. Requests for substitution during the bidding period, in accordance with the requirements of the Special Conditions, must be accompanied by a complete product submittal with all features, accessories and capacities noted. Large equipment must include a 1/4" scale drawing showing how the equipment and required access space are compatible with the available space. Acceptance for bidding does not waive the post bidding requirement for formal submittal and approval.

1.09 REMOVAL OF RUBBISH AND CLEAN-UP

A. Keep area of operations free from accumulation of waste material or rubbish at all times. At the completion of the work, remove all rubbish, tools, scaffolding and surplus materials from the area

of operations. The exposed parts of the Mechanical installation which are to be painted shall be thoroughly cleaned of cement, plaster, grease, oil spots and other materials in preparation for painting. All piping shall be cleaned of cement, plaster and other construction debris prior to being concealed above accessible ceilings or being insulated. Clean exposed piping prior to final inspection. All construction areas shall be left "broom" clean on a daily basis. Prior to final acceptance, vacuum clean all mechanical rooms including equipment.

1.10 LUBRICATION

A. After the installation is completed, lubricate all moving parts of all equipment furnished under this Division of the Specifications requiring same. Leave with the Owner a brief but complete set of lubrication instructions, showing the recommended frequency of lubrication and the type of lubricant recommended for each piece of equipment.

1.11 NOISE AND VIBRATIONS

A. The Contractor shall guarantee that the entire system and its component items of equipment, as installed by him, shall operate without objectionable vibration or noises, as determined by the Architect. If, in the opinion of the Architect, objectionable vibration or transmission thereof to the building occurs, the Contractor shall execute such remedial measures as are necessary to eliminate such unsatisfactory operating conditions and the material and labor thereby required shall be performed at the Contractor's expense.

1.12 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. ELECTRICAL: Power wiring is specified in the Electrical Section. Interlock and control wiring (any voltage) is specified under this Section. Controllers and starters, unless part of a motor control center, are specified under this Section.

B. PAINTING OF EQUIPMENT, PIPING AND ACCESSORIES: Painting Section. However, all items furnished under this Section shall be kept clean and free from corrosion.

C. OPENINGS: Various Sections. However, the locations of all inserts and openings shall be determined under this Section and coordinated with other Sections in ample time to avoid cutting new construction.

D. CUTTING, PATCHING AND FURRING: Various Sections. However, the locations of all inserts and openings shall be determined and coordinated with other sections.

E. EQUIPMENT AND PIPING SUPPORTS: Refer to structural drawings, details and notes for specific support and pipe hanging requirements. Specific loading and attachment methods shall be followed to assure that individual structural members are not overloaded.

1.13 GENERAL EQUIPMENT REQUIREMENTS

A. Manufacturer's printed directions shall be followed for preparing, assembling, installing, erecting and cleaning manufactured materials or equipment, unless otherwise directed.

1.14 SHOP DRAWINGS

A. Submit seven complete sets of shop drawings checked and certified by the contractor as being checked, and lists of materials furnished under this Division. Shop drawings shall be approved before installation of the material under consideration.

B. Shop Drawings shall consist of published ratings of capacity data, detailed construction drawings, wiring and control diagrams, performance curves, installation instructions, manufacturer's installation drawings and other pertinent data. Where the literature is submitted covering a group or series of similar items, the item under consideration shall be clearly indicated. Shop drawing shall list VOC of materials. Materials with VOC levels higher than LEED and code requirements will be rejected. Drawings shall be submitted showing revisions to equipment layouts due to use of alternate or substitute equipment. The front sheet of each copy of the submittal shall have the following typed information. Any submittal without all of the below information will be rejected without review:

1. Job name and location.

2. General Contractor's name, address, Project Manager's name and telephone number.

3. Submitting Sub-contractor's name, address, Project Manager's name and telephone number.

4. Suppliers company name, address, salesman's name and telephone number.

5. Signature of an officer or attorney-in-fact of the Sub-contractor with date and title and a statement that the submittal materials and equipment complies with the Contract Documents.

C. Equipment that has regional representation shall only be supplied by the regional representative that serves the area where the project is located. The regional representative’s name and signature shall be included with the shop drawing.

D. Shop Drawings are required for but are not limited to the following items:

Plumbing Carriers, Drains & Cleanouts	Water Heaters
Plumbing Piping Insulation	Plumbing Fixtures & Equipment
Pipe Markers and Valve Tags	Plumbing Piping, Valves & Fittings
Coordination Drawings	Fire Sprinkler Drawings & Hydraulic Calcs
Sample Test Wells	Fire Sprinkler Equipment, Piping and Valves
Acid Neutralization Tanks	Domestic Water Booster Pumps
Fire Pumps and Controllers	Surge Tank

E. Approval of these submittals shall not be construed as releasing the contractor from compliance with the contract Documents. They are a means of coordinating the work and aiding in the proper selection and installation of equipment. Do not release items such as fire dampers and starters until associated equipment or ductwork drawings are approved. All materials and equipment shall be subject to final acceptance by the Engineer at the completion of construction and adjustments

of the system.

F. If a submittal is returned to the Contractor marked “Rejected” or “Revise and Resubmit”, only one (1) additional submittal will be permitted without the Contractor incurring charges for the additional re-submittals. LTY Engineers (LTY) shall be reimbursed by the Contractor for any expense in connection with any necessary submission in addition to the two (2) submissions allowed. Contractor shall pay LTY $500 for review of EACH additional submission beyond the two (2) submissions allowed. For shop drawing submittals beyond the two (2) submissions allowed, a $500 cashier’s check shall be included with such submittals or LTY will not review the submittal.

1.15 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to jobsite until progress of construction has reached the stage where equipment is actually needed, or until building is closed in enough to protect equipment from the weather. Equipment allowed to stand in weather will be rejected, and Contractor is obligated to furnish new equipment at no cost to Owner.

B. Adequately protect equipment (including all Owner-furnished items) from damage after delivery to job. Cover with heavy cloth as required to protect from damage.

C. Equipment which has been damaged by construction activities will be rejected. Contractor shall furnish new equipment at no cost to Owner.

1.16 CUTTING AND PATCHING

A. Coordinate the work with other trades to arrange for all holes, chases, and other spaces necessary for the installation of all components of the mechanical systems. Inform the other trades in ample time for these to be provided. Failure to comply with this requirement may necessitate cutting and patching work. If such work becomes necessary, it will be done under this Section of the specifications, and shall conform to all applicable requirements of other Sections of the Specifications.

1.17 STRUCTURAL STEEL

A. All structural steel used for the purpose of fabricating pipe supports, pipe guides, pipe anchors, equipment supports, and framing for large ducts and plenums, shall conform to ASTM Designation A-36. All steel used for these purposes shall be new, clean, straight and galvanized.

1.18 CONCRETE PADS

A. All equipment mounted on the floor shall have a concrete house keeping pad. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge. Nominal thickness shall be 4”. Refer to details for outdoor equipment.

1.19 SPARE PARTS LISTS, OPERATING INSTRUCTIONS

A. At completion of job, furnish three copies of spare parts lists and operating instructions for all equipment furnished under this Division. These lists and instructions shall be published by the manufacturer of the equipment and shall be in good condition. Bind in 3-ring binder with project name.

1.20 TOOLS AND SPARE PARTS

A. Upon completion of the installation, deliver to the Owner all tools and spare parts that are furnished by the Equipment Manufacturer for use with the equipment furnished under this Contract.

1.21 RECORD DRAWINGS

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 flowline 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 blueline 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 2000 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. Revise 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 plumbing isolation 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.

1.22 OWNER'S INSTRUCTIONS

A. Provide four hours of instruction to the Owner's designated personnel upon completion of the system's installation.

1.23 ALTERNATES

A. Determine the scope of each specified alternate proposal by carefully reading all Divisions of the Documents. The Bid Form contains information explaining the extent of the construction to be performed under a specific alternate. Alternate proposals, which are not predominantly mechanical in scope, are described in other Divisions of these Documents. Pay particular note to re-roofing items that may necessitate adjustments to existing piping.

B. Alternative Equipment: Certain types of equipment as listed below require the specified brand and model to be included in the base bid. At the contractor’s option, he may propose equivalent equipment from one of the listed alternate manufacturers for one or more of these types of equipment. The contractor shall list in this alternate bid the name of the item, manufacturer’s name, model number and the amount to be deducted from his base bid.

1.24 MEP INSPECTIONS

A. Contractor shall formally request inspections from LTY and owner to review any and all MEP installations. Inspections shall include but not be limited to: pipe tests, underground installations prior to backfill, rough-in installations, wall cover inspections, above ceiling inspections, final inspection. Owner and City shall also be included in inspection requests; however, approval of installation by Owner or City does NOT absolve the Contractor of the required inspection and approval of all Plumbing installations by LTY nor take the place of the required inspection and approval of all Plumbing installations by LTY.

B. Information required from Contractor on each and every request for inspection is as follows:

1. Specific type of test (i.e. hydrostatic test, etc.).

2. Exact location of test (i.e. area of building with room numbers, riser number for sanitary waste / vent plumbing tests, etc.).

3. Description of test (i.e. partial inspection, walls only, chase walls, wall cover, ceiling cover, etc.)

4. Exact time test started (required test time per Project Manual will need to have elapsed prior to LTY inspection). Estimated time test will start will not be acceptable.

5. Pressure reading on gauge at time of request for all pipe tests (provide picture of gauge with request).

6. Verification from General Contractor with name of person that verified, that specific test has been verified by the Contractor and all sub-contractors to meet all requirements of the Specifications and Codes (prior to inspection request).

C. Contractor shall provide a MINIMUM of 48-hour notice prior to requested inspection time, no exceptions.

D. INSPECTION REPORTS: After each inspection, LTY will generate an inspection report and distribute promptly. The Contractor will then be given 7 working days from date of report to address all deficiencies listed on the report. The GENERAL CONTRACTOR shall verify that all items on each inspection report have been addressed by their subcontractors in this time period. Once verified the GENERAL CONTRACTOR shall sign-off on each deficiency listed on the report and return the signed-off copy of the inspection report to LTY via e-mail. After the signed-off report is returned to LTY, the GENERAL CONTRACTOR shall request a re-inspection by LTY to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, LTY reserves the right to re-inspect whenever our schedule allows, with these re-inspections still being subject to Paragraph E below.

E. TEST REJECTIONS AND RE-INSPECTIONS: If a test is rejected or a re-inspection of an issued LTY Inspection Report is found to NOT be completely addressed, only ONE (1) additional inspection will be permitted without the Contractor incurring charges for each additional inspection required. LTY shall be reimbursed $500 by the GENERAL CONTRACTOR for expenses in connection with EACH inspection in addition to the two (2) inspections allowed. For inspections beyond the two (2) allowed inspections, a $500 cashier’s check shall be provided at the time of each additional inspection or LTY will not perform the inspection.

1.25 CONSTRUCTION PHASING

A. Phasing of construction shall be the sole responsibility of the General Contractor. Construction phasing shall accommodate all needs and schedules required by the Owner. All costs for construction shall be included in the price submitted by the Contractor on the bid date. No additional money will be approved for the Contractor or their sub-contractors to accommodate costs (including labor) associated with construction phasing.

END OF SECTION 22 00 00

SECTION 22 00 05
PLUMBING OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.01 PLUMBING OPERATION AND MAINTENANCE MANUAL

A. 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.

B. Sections for Equipment and Systems.

1. Content for each unit of equipment and system as appropriate:

a. Description of unit and component parts.

1) 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. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.

m. 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 backflow preventer certified test reports.

10. Provide gas piping pressure test reports.

a. Comply _____ (initials)

b. N/A

c. Do not comply:

_____
_____
_____
_____
_____

END OF SECTION 22 00 05

SECTION 22 01 00
COORDINATION DRAWINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 22 00 00 General Plumbing

PART 2 - REQUIREMENTS

2.01 COORDINATION DRAWINGS

A. The Mechanical Contractor shall take the lead in coordinating the Mechanical (HVAC), Electrical, Plumbing and Fire Protection Systems within the building.

B. The Mechanical Contractor shall coordinate a three-dimensional (3-D) model of the building which includes the Mechanical (HVAC), Electrical, Plumbing and Fire Protection Systems. The Electrical, Plumbing and Fire Protection Contractors shall prepare their work and generate 3-D models which will be given to the Mechanical Contractor for coordination. The Contractor will be provided with the REVIT model and AutoCAD files that were used to generate the contract documents. These files may be used as the background file. The Contractor shall replace the systems drawn with the actual shop drawing models. The Contractor is not limited to using REVIT but may use any 3-D software in generating and combining the coordination model. If an alternate software is used, all contractors must agree to provide compatible software models.

C. Submitting the contract drawings as coordination drawings will not be acceptable.

D. The model shall include detailed and accurate representations of all equipment to be installed based upon the reviewed equipment submittals.

E. The Mechanical Contractor shall hold a 3-D coordination meeting with all sub-contractors present to review the model and discuss coordination of the installation of the building systems.

F. Upon completion of the coordination meeting, the Contractor shall submit the 3-D model and 1/4” scale drawings for review.

G. The model shall detail major elements, components, and systems in relationship with other systems, installations and building components. Indicate locations where space is limited for installation and access, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of pipe, duct, equipment and other materials. Include the following:

a. Wall and type locations

b. Clearances for installing and maintaining insulation.

c. Locations of light fixtures and sprinkler heads.

d. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.

e. Equipment connections and support details.

f. Exterior wall and foundation penetrations.

g. Routing of storm and sanitary sewer piping.

h. Fire-rated wall and floor penetrations

i. Sizes and locations of required concrete pads and bases.

j. Valve stem movement.

k. Structural floor, wall and roof opening sizes and details.

2. Indicate scheduling, sequencing, movement and positioning of large equipment in the building during construction.

3. Prepare floor plans, elevations and details to indicated penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air distribution devices, light fixtures, communication systems components and other ceiling mounted items.

H. Sequence of Coordination

Below is hierarchy of model elements and the sequencing by which the models will be coordinated:

1. Structural and Architectural Model

2. Miscellaneous steel

3. Perform preliminary space allocation

4. Identify hard constraints (locations of access panels, lights, A/V space requirements, etc.

5. Main and medium pressure ducts from the shaft out

6. Main graded plumbing lines and vents.

7. Sprinkler mains and branches

8. Cold and hot water mains and branches

9. Lighting fixtures and plumbing branches

10. Smaller sized ducts and flex ducts

11. Smaller size cold water and hot water piping, flex ducts, etc.

I. The Contractor and Sub-Contractors shall not install any item until the coordination has been completed and reviewed by the Construction Manager, Owner and A/E Team.

J. This Contractor shall be responsible for coordination of all items that will affect the installation of the work of this Division. This coordination shall include but not be limited to: ampacity, capacity, electrical and piping connections, space requirements, system construction, building requirements and special conditions.

K. By submitting shop drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

END OF SECTION 22 01 00

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 – MATERIALS AND METHODS

2.01 PIPE MARKING

A. Identify all new system piping. Use Opti-Code Brady pressure sensitive adhesive pipe markers consisting of pipe marker and direction of flow arrow tape. Background colors of markers, arrows and tape of each type of pipe system shall be of appropriate legend and background color to meet all ANSI/OSHA/ASME standards, complete with direction arrow. Select appropriate size for O.D. of piping including insulation. Clean pipe PRIOR to installation of pipe markers. Markers or arrows not wrapping the full circumference of the pipe shall be tie wrapped in place, otherwise taped at each end around full circumference of pipe. Provide minimum 2-1/4" letters through 4" pipe and 4" letters for piping larger than 4". For exterior piping or piping inside mechanical rooms, provide Snap-Around pipe markers up to 4" pipe and Strap-Around pipe markers for piping larger than 4". Manufacturer shall be Brady or approved equal.

B. Apply markers as follows:

1. At input and output of each piece of equipment inside building.
2. At each valve not in a mechanical room.
3. At every point a pipe enters or exits a wall or floor (both sides of wall or floor).
4. At intervals not exceeding 20 feet.
5. Any location where view is obstructed.

C. These markers shall conform to OSHA and ANSI A 13.1 Codes. Arrow markers must have same ANSI background colors as their companion pipe markers and wrap completely around pipe with 3" overlap.

D. Pipe markers and arrow markers shall be provided as follows:

1. Domestic Cold Water
2. Domestic Hot Water
3. Domestic Hot Water Return
4. Sanitary Waste
5. Sanitary Vent

6. Roof Drain Leader

7. Overflow Roof Drain Leader

8. Fire Sprinkler Piping

9. Fire Standpipe

10. Compressed Air

11. Vacuum

12. Natural Gas

13. Acid Waste Piping

14. Acid Vent Piping

E. MANUFACTURER PIPE LABELING: All piping shall be labeled by manufacturer along entire length of pipes. Labeling shall indicate SIZE, CLASS, MATERIAL SPECIFICATION, NAME OF MANUFACTURER and COUNTRY OF ORIGIN. Piping not properly labeled by manufacturer with the information listed above will be removed from site and replaced at no cost to Owner.

2.02 EQUIPMENT MARKING

A. GENERAL: Each piece of plumbing equipment shall be suitably marked with the name as listed on the plans. Name shall be prominently displayed so it may be easily located and read after equipment installation. Pumps may be marked on adjacent piping.

B. The following equipment shall be marked with lamacoid nameplate, 2" high letters:

1. Water Heaters

2. Air Compressor

3. Vacuum Pump

4. Surge Tank – Domestic Water

5. Surge Tank – Fire Water

6. Fire Pump

C. The following equipment shall be marked with laminated engraved plastic nameplate with 1.25" high letters, fastened with epoxy or screws:

1. Circulator Pumps

2. Air Dryer

3. Lab Gas Solenoid Valve Box

4. Elevator Sump Pump Control Panel

5. Jockey Pump

6. Fire Pump Controller

7. Jockey Pump Controller

2.03 VALVE MARKING

A. Each valve, except those located adjacent to the equipment they serve, shall have a tag of heavy-gauge 1½" diameter brass, stamped and engraved in black with the valve number and service symbol. Attach tag to the valve handle with a chain of similar gauge and material.

B. On the "As Built" Drawings, mark the symbol and number of all valves, exactly as the valves are tagged.

C. Furnish a valve schedule properly identifying the valve number and service with the exact location, the material within the pipe and the room numbers or area that the valve serves. This schedule shall be furnished on reproducible film suitable for reproduction on an ozlid machine.

D. Provide one valve schedule, as above, installed in aluminum frame with lexan shield, and mount on wall of main equipment room.

E. In areas with lay-in ceiling, glue a red or blue dot for hot and cold valve locations on the grid.

2.04 PAINTING

A. GENERAL: All piping or insulation on piping exposed to view shall be painted color directed by Architect. Insulated pipe with required metal jacket shall also be painted in areas directed by Architect. Reference Architectural Contract Documents.

B. PAINT TYPE: Industrial grade, high gloss enamel over suitable primer. Provide two finish coats.

C. COLOR CODING: (Verify color with Architect prior to painting)

1. Gas Piping Yellow

2. Fire Sprinkler Red

3. Fire Standpipe Red

END OF SECTION 22 05 53

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Install all insulation in conformance with manufacturer's recommendations and these specifications.

B. All interior adhesives and sealants must meet VOC limit requirements of South Coast Air Quality Management District (SCAQMD) Rule #1168. Must comply with the TIPS requirements.

C. All interior paints and coatings must meet VOC limit requirements of South Coast Air Quality Management District (SCAQMD) Rule #1113 and Green Seal GS-11 and GS-03. Must comply with the TIPS requirements.

D. Insulation materials manufactured by the following list of companies will be acceptable provided their materials conform to these specifications (see Paragraph on Substitution): Armstrong, CertainTeed, Childers, Foster, Knauf, Koolphen, Manville, Owens-Corning and Pittsburg-Corning.

E. Flame Spread and Smoke Requirements:

1. All jackets, adhesives, coatings, insulating materials and vapor barrier mastics for piping and equipment shall have a flame spread not higher than 25 and smoke developed rating not higher than 50.

2. All materials containers shall have a U. L. Label.

F. At each pipe support point, provide formed 16 gauge galvanized sheet metal saddle, with length three times pipe size, 8” minimum. Sheet metal saddle shall be secured to pipe insulation using aluminum band at both ends of saddle. For all piping, install a hard section of Koolphen K phenolic foam pipe insulation, with length three times pipe size, minimum 8" length, 360° around pipe, same thickness as adjacent insulation, to prevent compression at support bearing area. Provide 1/2" aluminum band and clamps at each end of saddle. Seal and finish to match adjoining insulation.

G. Install .020" thick aluminum jacket with minimum 2” overlap joint on all insulated piping exposed outside building. Install factory made aluminum covers on all elbows. Cut aluminum neatly to fit all tees, such that all insulation is covered by aluminum. Use waterproofing aluminum colored Foster 95-44 or Childers CP-76-1 sealer to seal all joints. Provide .020x3/4” aluminum bands not more than 12" on center for all jacketing. Install aluminum covers on insulated pipe inside that is exposed to view in finished areas including inside gymnasiums, shop areas and any areas with partial or no ceilings. Cover is not required in mechanical or AHU rooms. Jacketing in contact with soil shall be .010" stainless steel.

PART 2 - MATERIALS AND METHODS

2.01 DOMESTIC COLD WATER PIPING

A. Insulate all water piping outside and above grade, in exterior walls, within eight (8) feet of exterior walls, inside concrete block walls (not including 6” or deeper chase walls unless concrete touches piping), inside walls where concrete touches piping, central mechanical and boiler room piping, piping inside the building but outside the building insulation (i.e. above insulation on ceiling), in basements and all unconditioned spaces and all piping subject to condensation with 1" thick factory molded fiberglass pipe covering, density not less than 3 pounds per cubic foot, conductivity (k) not higher than .25 at 100° mean temperature difference with factory attached fire retardant, vapor barrier jacket. Piping exposed to view in finished areas, including inside gymnasiums, shop areas and any areas with partial or no ceilings, shall have aluminum jacketing per specification.

B. For piping outside or in unconditioned buildings or spaces, including pipe entry to building at grade and backflow preventers, provide 1.5” thick, 3.7 PCF, Molded Koolphen K phenolic foam pipe insulation. Install .010” stainless steel protective jacket from building wall to 6” below grade. Insulation and jacketing for backflow preventers shall be installed with easily removable sections to allow periodic servicing, testing and inspection of backflow preventer without damaging insulation installation or integrity.

C. Install insulation over pipe and carefully connect self sealing laps. Provide 3" butt strips at each joint between sections, sealed with Foster 85-75 or Childers CP-82 adhesive. Coat all vapor retarder film (ASJ) longitudinal and butt joints with anti-fungal Foster 30-80AF vapor barrier coating to prevent moisture ingress. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils.Apply Foster 95-50 or Childers CP-76 insulation joint sealant in phenolic insulation longitudinal and butt joints to prevent moisture ingress.

D. Insulate fittings with pre-molded cover of same materials and thickness as pipe covering. Field fabricated, mitred fittings will not be accepted. Coat all fittings and elbows with anti-fungal Foster 30-80AF vapor barrier coating and reinforcing mesh. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils.

2.02 DOMESTIC HOT WATER AND TEMPERED WATER PIPING

A. Insulate all hot water supply and return piping, including tempered water and booster heater piping, with factory molded pipe covering made from glass fibers; 1" thick with density not less than 3 pounds per cubic foot; conductivity (k) not higher than .25 at 100° mean temperature difference; with factory attached fire retardant jacket. Piping exposed to view in finished areas, including inside gymnasiums, shop areas and any areas with partial or no ceilings, shall have aluminum jacketing per specification.

B. Install insulation over pipe and carefully connect self sealing laps. Provide 3" butt strips at each joint between sections, sealed with Foster 85-75 or Childers CP-82 adhesive. Coat all vapor

retarder film (ASJ) longitudinal and butt joints with anti-fungal Foster 30-80AF vapor barrier coating to prevent moisture ingress. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils. Apply Foster 95-50 or Childers CP-76 insulation joint sealant in phenolic insulation longitudinal and butt joints to prevent moisture ingress.

C. Insulate fittings with pre-molded cover of same materials and thickness as pipe covering. Field fabricated, mitred fittings will not be accepted. Coat all fittings and elbows with anti-fungal Foster 30-80AF vapor barrier coating and reinforcing mesh. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils..

2.03 SANITARY DRAIN PIPING ABOVE GRADE

A. GENERAL: Insulate all horizontal and vertical piping, fittings, hub drain, floor drain and floor sink bodies receiving condensate from air conditioning and refrigeration equipment. Also insulate all plastic piping inside walls (if any) where concrete touches piping.

B. MATERIALS: 1½" thick flexible fiberglass blanket with vapor barrier or 1" thick fiberglass pipe insulation with vapor barrier.

C. EXECUTION: Seal vapor retarder laps with white Foster 85-75 or Childers CP-82 and staple at 4" on center. Vapor seal staples with Foster 30-80AF. Provide 3" butt strips at each joint between sections and seal as above. Install vapor stop every 15'-0" using Foster 30-80AF. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils. Piping exposed to view in finished areas, including inside gymnasiums, shop areas and any areas with partial or no ceilings, shall have aluminum jacketing per specification.

2.04 STORM DRAINAGE PIPING ABOVE SLAB

A. GENERAL: Insulate horizontal and vertical piping including roof drain bodies. Overflow drains and piping are included in this specification. All piping above grade shall be insulated.

B. MATERIALS: 1½" thick flexible fiberglass blanket with vapor barrier or 1" thick fiberglass pipe insulation with vapor barrier.

C. EXECUTION: Seal vapor retarder laps with white Foster 85-75 or Childers CP-82 and staple at 4" on center. Vapor seal staples with Foster 30-80AF. Provide 3" butt strips at each joint between sections and seal as above. Install vapor stop every 15'-0" using Foster 30-80AF. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils. Piping exposed to view in finished areas, including inside gymnasiums shop areas and any areas with partial or no ceilings, shall have

aluminum jacketing per specification.

2.05 DRINKING FOUNTAIN DRAIN LINES

A. Insulate from connections to fountains to connection to next larger size drain, or, if drain runs into floor, from fountain to floor, with 1/2" thick pipe covering the same as for Domestic Cold Water Piping.

2.06 FIRE SPRINKLER AND STANDPIPE PIPING

A. For wet fire sprinkler and standpipe piping outside buildings, insulate with 2” thick, 3.7 PCF Molded Koolphen K phenolic foam pipe insulation. All insulated piping shall have aluminum jacketing over insulation.

B. Install insulation over pipe and heat trace and carefully connect self sealing laps. Provide 3" butt strips at each joint between sections, sealed with Foster 85-75 or Childers CP-82 adhesive. Coat all vapor retarder film (ASJ) longitudinal and butt joints with anti-fungal Foster 30-80AF vapor barrier coating to prevent moisture ingress. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils. Apply Foster 95-50 or Childers CP-76 insulation joint sealant in phenolic insulation longitudinal and butt joints to prevent moisture ingress.

C. Insulate fittings with pre-molded cover of same materials and thickness as pipe covering. Field fabricated, mitred fittings will not be accepted. Coat all fittings and elbows with anti-fungal Foster 30-80AF vapor barrier coating and reinforcing mesh. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils.

END OF SECTION 22 07 19

SECTION 22 08 00
PLUMBING SYSTEMS TECHNICAL COMMISSIONING REQUIREMENTS

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. The purpose of this Section is to define responsibilities in the Commissioning Process. Additional system testing is required within individual Specification Sections.

B. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. General Commissioning requirements and coordination are detailed in Division 01. Division 20-25 Contractors shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Owner's CxA, shall execute all Commissioning responsibilities assigned to them in the Contract Documents and include the cost of Commissioning in the Contract price.

C. Plumbing systems to be commissioned include the following:

1. Domestic Water Heaters
2. Domestic Water Circulation Pumps
3. Domestic Water Booster Pumps

1.03 DEFINITIONS

A. Refer to the General Commissioning Requirements for definitions.

1.04 SUBMITTALS

A. Contractor shall provide Owner and/or CxA with documentation required for Commissioning Work. At minimum, documentation shall include: Detailed Start-up procedures, full sequences of operation, Operating and Maintenance data, performance data, control drawings, and details of Owner-contracted tests.

1. Shop drawings and product submittal data related to systems or equipment to be commissioned

B. Contractor shall submit to Owner and/or CxA installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians.

C. Where installation testing may be performed in a progressive manner (i.e., piping hydrostatic testing), the Contractor shall prepare and submit to the Owner, A/E team and CxA a testing plan that details how the progressive testing will be performed, documented and presented for approval prior to the start of any testing activities.

D. Contractor shall provide any additional documentation needed to complete the requirements of the Commissioning Process

1. Factory Performance Test Reports: Review and compile all factory performance data to assure that the data is complete prior to executing the FPTs.

2. Installation testing reports such as piping hydrostatic testing, piping chemical treatment and flushing, bolt flange torqueing, and any documentation associated with local code authority inspections or authorizations.

3. Completed equipment Start-up certification forms along with the manufacturer's field or factory performance and Start-up test documentation.

4. Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials and installation shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Refer to the General Commissioning Requirements for other work products related to the Commissioning Process

C. Contractor is required to follow all applicable industry and site specific safety practices, lockout / tagout requirements, specialized PPE requirements, and provide qualified, trained personnel to execute Commissioning Process requirements.

2.02 TEST EQUIPMENT

A. Contractor shall provide all specialized tools, test equipment and instruments required to execute Start-up, checkout, and testing of equipment.

B. All specialized tools, test equipment, and instruments required to execute Start-up, checkout, and testing of equipment shall be of sufficient quality and accuracy to test and/or measure system performance within specified tolerances. A testing laboratory must have calibrated test equipment within the previous twelve (12) months. Calibration shall be NIST traceable. Contractor must calibrate test equipment and instruments according to manufacturer's recommended intervals and whenever the test equipment is dropped or damaged. Calibration tags must be affixed to the test equipment or certificates readily available.

PART 3 – EXECUTION

3.01 CONSTRUCTION PHASE

A. In each purchase order or subcontract that is written for changes in scope, include the appropriate requirements for submittal data, Commissioning documentation, testing assistance, Operating and Maintenance (O&M) data, and training, as a minimum.

B. Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Owner, CxA or Contractor to facilitate the Commissioning process.

C. Provide manufacturer's data sheets and shop drawing submittals of equipment.

D. Provide additional requested documentation to the Owner and/or CxA, prior to O&M manual submittals, for development of System Verification Checklists and Functional Performance Testing procedures.

1. Typically, this will include detailed manufacturer's installation and Start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, full factory testing reports, if any, and full warranty information.

2. In addition, the installation, Start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory field technicians shall be submitted to the Contractor and/or CxA.

3. This information and data request may be made prior to normal submittals.

E. During the installation, Start-up and initial checkout process, execute and document related portions of the System Verification Checklists for all commissioned equipment according to the procedures indicated in the Commissioning Plan.

F. Factory Start-ups: Factory Start-ups are specified for certain equipment. Factory Start-ups generally are Start-up related activities that will be reviewed and checked prior to Functional Performance Tests. All costs associated with factory Start-ups shall be included with the contract price unless otherwise noted. Notify the Commissioning Team of the factory Start-up schedule and coordinate these factory Start-ups with witnessing parties. The Commissioning Team members may witness these Start-ups at their discretion.

G. Independent Testing Agencies: For systems that specify testing by an independent testing agency, the cost of the test shall be included in the Contract price unless otherwise noted. Testing performed by independent agencies may cover aspects required in the System Verification Checklists, Start-ups, and Functional Performance Tests. Coordinate with the independent testing agency so that CxA, Owner and/or A/E can witness the test to ensure that applicable aspects of the test meet requirements.

H. Incorporate manufacturer's Start-up procedures with System Verification Checklists (SVC).

I. Provide skilled technicians to execute starting of equipment and to assist in execution of Functional Performance Tests. Ensure that they are available and present during the agreed-upon schedules and for a sufficient duration to complete the necessary tests, adjustments, and problem solving.

J. Correct deficiencies (differences between specified and observed performance) as interpreted by the Owner's Project Manager and A/E and retest the system and equipment.

K. During construction, maintain as-built marked-up Drawings and Specifications of all Contract Documents and Contractor-generated coordination Drawings. Update after completion of Commissioning activities (include deferred tests).

L. Provide training of the Owner's operating personnel as specified.

M. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

3.02 WARRANTY PHASE

A. Execute seasonal or deferred tests, witnessed by the CxA and Owner, according to the Specifications.

1. Complete deferred tests as part of this Contract during the Warranty Period. Schedule this activity with the Owner.

B. Correct deficiencies and make necessary adjustments to O&M manuals, Commissioning documentation, and as-built drawings for applicable issues identified in any deferred or seasonal testing.

3.03 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 installation shall be in accordance with the Project Documents.

3.04 TRAINING

A. Refer to the individual section of this Specification for specific training requirements on each system.

B. Refer to the General Commissioning Requirements and Division 01 for overall training requirements related to the Commissioning process and this project.

END OF SECTION 22 08 00

SECTION 22 11 11
NATURAL GAS PIPING

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops. Piping shown underground shall be buried a minimum of 12 inches to top of pipe. Piping in the vicinity of equipment shall be arranged to not interfere with access panels and maintenance space. Provide unions, flanges and shutoff valves to allow removal of the equipment and its subassemblies.

B. Piping shall be concealed in wall, chases and above ceilings except in the vicinity of equipment. All materials shall conform with the requirements of the local code authority.

C. All below grade non-metallic, non-conducting pipe not under building slab shall have a tracer wire installed parallel to pipe. Tracer wire shall be a 14 gage, solid copper wire with PVC jacket with all joints and splices sealed water-tight. Carry end of wire up through slab and terminate in an accessible location. Provide identification label attached to wire.

D. All piping, fittings and valves shall be manufactured in the United States of America. Acceptable pipe manufacturers are Bull moose Tube and Wheatland. Other domestic manufacturers will be considered for approval.

E. Provide pipe markers, pipe painting and valve tags per the Specifications, Section 22 05 53.

PART 2 — METHODS

2.01 EXCAVATION AND BACKFILLING

A. GENERAL: Provide all excavation and backfilling required for the proper installation of all underground piping and other components installed below grade.

B. EXCAVATION: Trench with ladder type trenching machine. Make trenches 6" wider than outside diameter of pipe. Excavate, backfill and grade trench bottom.

C. BACKFILLING:

1. Backfill for pipe in City Property must comply with City requirements.

2. For non-drainage lines backfill with approved backfill material to 95% standard proctor, by hand compaction.

2.02 PIPE SUPPORTS

A. GENERAL: Provide pipe supports and guides of size and type to support pipe as well as limit movement. Minimum size hanger rod shall be 3/8”. Piping connected to a piece of equipment shall have a support located near enough to the equipment that there will be no pipe weight supported by the equipment. In no case shall the nearest support be more than two feet horizontally from the connection point. Pipe support material shall be selected to be compatible with the pipe material to prevent galvanic corrosion.

B. HORIZONTAL PIPING:

1. SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than below:

Pipe Size	Steel Pipe
1" & Smaller	6 Feet
1¼" & 1½"	8 Feet
2"	8 Feet
2½" to 4"	8 Feet
6" and Larger	8 Feet

2. SUPPORT FROM ABOVE: Support piping near roof or upper floor from structure if sufficient strength exists. Use a method suitable for type of construction and of sufficient strength. Use threaded steel hanger rods of diameter required to safely support loads. Minimum size hanger rod shall be 3/8”. Install rods through holes drilled in beam flanges, 1½" x 1½" x 8" angles welded to structural members or top cord slot at joist panel points and secure with large washers and nuts. Refer to structural drawing details for additional information. Do not use perforated strap. ***DO NOT USE CONCRETE ANCHORS.***

3. HANGERS: Manufactured by Anvil, Grinnell or Tolco.

   a. SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

   b. BEAM CLAMPS: Grinnell Figure 92 for smaller pipe

4. SUPPORT FROM BELOW: All piping near the floor, or where ceiling structure does not have sufficient strength, or where there is no ceiling shall be supported from below. Support members shall be steel pipe with base plates, or welded steel structure suitably braced.

5. SUPPORT MATERIAL FINISH: Cadmium plated steel (including all thread rods).

2.03 VALVE INSTALLATION

A. Ball valves shall be installed such that handle for valve is positioned on the side of the pipe and is pulled down to close the valve.

2.04 TESTING GAS PIPING SYSTEMS

A. GENERAL: All new and existing gas piping shall be tested and repaired as required for safe operation and the passing of the Texas Railroad Commission requirements.

B. GAS PIPING TESTING

1. Preliminary gas test as required by Code, but a minimum test pressure of 50 PSIG held for not less than eight hours without noticeable drop.

2. Test joints with a soap solution while lines are under pressure. Repair any leaks that are detected.

3. Final gas test shall be with a diaphragm gauge with a minimum dial size of 3.5 inches with a set hand and a pressure range not to exceed 20 PSIG with 2/10 pound increments. The minimum test pressure shall be not less than 10 PSIG and the maximum pressure shall not exceed 12 PSIG. The test shall be observed by the Owner's Representative AND LTY for a minimum of 4 hours with no drop in pressure.

4. Perform gas piping test as required by the Texas Railroad Commission and submit competed Texas Pipeline Safety Form PS-86B.

5. Provide a copy of the gas pressure test reports in the Operations & Maintenance Manual provided at closeout.

C. FINAL TEST: Subject each piping system to its normal operating pressure and temperature for not less than twenty-four hours. The piping systems 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.

SLEEVES

A. Provide sleeves for all piping passing through walls, floors not on grade and roof slabs. Make sleeves of galvanized pipe and sized to provide clearance of 1/4" around piping or pipe insulation if pipe is insulated. Set end of sleeve flush with the surrounding surface of wall or ceiling in which sleeve is installed. Floor slab sleeves shall extend 3" above floor level. Provide vented sleeves for all gas piping below floor slabs or paved areas. Pipes through grade beams shall be sleeved per structural engineer's drawings. As a minimum pipe shall be wrapped with 1" thick closed cell pipe insulation.

3.02 PLATES

A. Provide chromium plated wall and ceiling plates for all exposed piping, at point piping passes through walls or ceilings. Plates shall be large enough to completely cover pipe sleeves. On insulated piping, inside diameter of plates shall just exceed outside diameter of pipe covering. Plates may be omitted for pipe sizes larger than 6".

3.03 VALVE AND FITTING SIZES

A. All hand valves, fittings and other piping accessories shall be size of the line in which installed unless specifically indicated otherwise on the Drawings.

3.04 DIELECTRIC UNIONS

A. Provide dielectric insulating unions at all connections between dissimilar metals, except at final fixture connections, such as galvanized pipe connection to brass water faucet.

3.05 FITTINGS

A. SCREWED: Conform to ANSI Specification B16.3.

3.06 VALVES AND DEVICES

A. GENERAL: All pressures shown below are minimum working pressures.

B. GAS VALVES (Ball valves only):

1. GAS VALVES up to 3": Ball type ANSI B16.33-1981, ANSI B16.38-1978 or UL 842-1980 approved and rated at the gas pressure of application. Nibco T-580-70-UL.

2. GAS VALVES for piping larger than 3": U.L. listed plug valve. DeZurick Series 425 or 435 eccentric valve with RS49 plug seals.

3. SMALL GAS COCKS: Nibco T-585-70-UL.

4. UNIONS: Brass insert, ground joint. Provide union at all equipment connections.

C. ACCEPTABLE MANUFACTURERS: Milwaukee, Hammond and Nibco

PART 3 — MATERIALS

4.01 NATURAL GAS, OUTSIDE BUILDING

A. GENERAL: Gas utility company will provide and install metering equipment for 5 psi service pressure. Extend piping from meter to building and install pressure reducing valve at building. Provide grounding per NFPA 70.

B. MATERIALS:

1. ABOVE GROUND: Schedule 40 black steel, ASTM ERW A-53, Grade B or ASTM A106, with welded joints. ALL PIPING SHALL BE WELDED. Piping and fittings 2" and smaller shall be socket-weld. Piping and fittings larger than 2" shall be butt-weld. Threaded nipples less than 1/2" shall be Schedule 80. All thread nipples are not allowed. All bolts , nuts and all thread used in the piping system and components shall be hot dipped galvanized or stainless steel to resist rust. For gas piping at emergency generator and rooftop ac units, flex connection shall NOT be concealed inside equipment housing – install hard pipe from equipment connection to outside housing and install flexible connection outside housing.

2. BELOW GRADE: Polyethylene gas piping conforming to ASTM D2513, installed per manufacturer's requirements. Install minimum #14 copper wire in trench with pipe for

locating purposes. Install welded polyethylene to schedule 40 steel pipe transition before exiting ground. Install dielectric union after piping exits the ground. Piping shall have socket heat fusion joints and fittings. For pipe sizes 1.5-2”, piping shall be SDR-11. For pipe sizes 3-4”, piping shall be SDR-11.5. Piping shall be manufactured by JM Eagle, Chevron Phillips Performance Pipe or other approved domestic manufacturer.

C. TESTING: As required by Code but minimum test pressure of 50 PSI held for not less than 24 hours without noticeable drop. Test all joints with a soap solution while lines are under pressure. Provide test tee in pipe at meter and downstream of building pressure reducing station. Reference Paragraph 2.4 – Testing Gas Piping Systems. Testing requirements shall meet requirements listed in Paragraph 2.4.

D. SLEEVES: Install pipe in vented sleeves when passing under roads, driveways, parking lots and similar areas. Sleeves shall be Schedule 40 PVC below grade and Schedule 40 galvanized steel otherwise. Install vent in a manner to prevent entry of rainwater, insects or foreign objects.

E. PAINTING: All gas piping outside shall be painted with two coats of industrial grade, yellow epoxy paint.

4.02 NATURAL GAS, INSIDE BUILDING

A. GENERAL: Extend gas to all fixtures, appliances and equipment as required.

B. MATERIALS ABOVE GRADE: Schedule 40 black steel, ASTM ERW A-53, Grade B or ASTM A106. Joints shall be welded except that piping in the kitchen 1" or smaller and downstream of the ansul valve shall have Class 150 malleable iron screw type fittings. Fittings for welded pipe will be socket-weld type. Threaded nipples less than 1/2” shall be Schedule 80. All thread nipples are not allowed. All bolts, nuts and all thread used in the piping system and components shall be cadmium plated to resist rust. Final connections at low pressure appliances shall be corrugated flexible brass connections with epoxy coating, complying with ANSI ANS-Z21-24-1981, minimum pressure rating of 1/2 PSI. Science lab gas cocks shall be “hard piped” with schedule 40 black steel as specified above. Flex connections will not be accepted at gas cocks.

C. MATERIALS BELOW GRADE: Do not install piping below grade.

D. INSTALLATION:

1. Do not install any gas piping in unventilated spaces unless totally encased with airtight sleeving. *NO GAS PIPING SHALL BE INSTALLED INSIDE WALLS.* Sleeving shall be all metallic construction, welded or screwed black steel, Schedule 40 or heavier. Sleeves shall be vented as shown on the Drawings.

2. Provide an all brass lever handle gas cock in an accessible location branch line at each individual piece of gas consuming equipment.

3. Branch connections to gas consuming equipment shall be size indicated on the Drawings up to points immediately adjacent to equipment. Do not reduce to size of equipment until immediately adjacent to equipment.

4. All welded connections shall be made with bevel-ended pipe by certified welders.

5. All branch connections shall be made off the top of the main line.

E. TESTING: As required by Code but minimum test pressure of 50 PSI held for not less than 24 hours without noticeable drop. Test all joints with a soap solution while lines are under pressure. Reference Paragraph 2.4 – Testing Gas Piping Systems. Testing requirements shall meet requirements listed in Paragraph 2.4.

F. PAINTING: All gas piping shall be painted with two coats of industrial grade, yellow epoxy paint.

4.03 GAS PRESSURE REGULATORS:

A. Size for full connected load, with stop valves on both inlet and outlet connections.

B. Equip with internal relief valve to vent full capacity if regulator fails wide open. Extend full size vent without reduction to the outside.

C. Provide weather and bug proof screening on vent.

D. Select orifices for inlet pressures established by gas company serving the building, and for outlet pressures as required to serve the proper pressure at the items of equipment being supplied.

E. Outlet pressure shall be field adjustable.

F. Capacities as indicated in Schedule plus 10%.

G. Unit shall conform to latest published ANSI Code.

H. ACCEPTABLE MANUFACTURERS: Invensys, Rockwell or Sensus.

END OF SECTION 22 11 11

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops. Piping shown underground shall be buried a minimum of 12 inches to top of pipe. Piping in the vicinity of equipment shall be arranged to not interfere with access panels and maintenance space. Provide unions, flanges and shutoff valves to allow removal of the equipment and its subassemblies without having to remove excessive amounts of building piping or drain water systems.

B. Piping shall be concealed in wall, chases and above ceilings except in the vicinity of equipment such as water heaters. Hot water shall be piped to left hand side of plumbing fixtures as user faces fixture. All materials shall conform with the City Building Code.

C. All piping, fittings and valves shall be manufactured in the United States of America.

D. Provide pipe markers and valve tags per Section 22 05 53 Identification of Plumbing Piping and Equipment.

PART 2 – METHODS

2.01 EXCAVATION AND BACKFILLING

A. GENERAL: Provide all excavation and backfilling required for the proper installation of all underground piping and other components installed below grade.

B. EXCAVATION: Trench with ladder type trenching machine. Make trenches 12" to 18" wider than outside diameter of pipe. Excavate, backfill and grade trench bottom.

C. BACKFILLING:

1. Backfill for pipe in City Property must comply with City requirements.

2. For non-drainage lines backfill with approved backfill material to 95% standard proctor, by hand compaction.

D. BENTONITE DAM:

1. Bentonite trench dams must be installed across the entire trench, including below the pipe, from the foundation wall to 5 feet outside of building.

2. Required locations: At all trenches 8" in width or wider which cross the building foundation perimeter grade beam (outside to inside the building footprint), provide a trench dam comprised of sodium bentonite. No additives permitted.

3. Bentonite trench dams shall be 6" wider than the pipe trench on each side, 6" below the pipe trench bottom, 1'-0" above the bottom of the grade beam, and directly adjacent to the foundation wall / grade beam outside the building foundation. Trench dam shall completely fill the trench around the pipe. Bentonite trench dams shall be a minimum of 12" thick unless otherwise noted. See civil, architectural or structural specifications for any additional requirements.

E. SAFETY SYSTEMS: Refer to Architectural Sections for additional requirements.

2.02 PIPE SUPPORTS

A. GENERAL: Provide pipe supports and guides of size and type to support pipe as well as limit movement. Minimum size hanger rod shall be 3/8”. Piping connected to a piece of equipment shall have a support located near enough to the equipment that there will be no pipe weight supported by the equipment. In no case shall the nearest support be more than two feet horizontally from the connection point. Pipe support material shall be selected to be compatible with the pipe material to prevent galvanic corrosion. Un-insulated copper piping shall be wrapped with gas wrap tape at each hanger (minimum 2” beyond hanger). Vertical copper piping shall have a minimum on one intermediate support if over five feet.

B. HORIZONTAL PIPING:

1. SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than below:

Pipe Size	Steel Pipe	Other Pipe
1" & Smaller	6 Feet	4 Feet
1¼" & 1½"	8 Feet	5 Feet
2"	8 Feet	5 Feet
2½" to 4"	8 Feet	6 Feet
6" and Larger	8 Feet	6 Feet

2. SUPPORT FROM ABOVE: Support piping near roof or upper floor from structure if sufficient strength exists. Use a method suitable for type of construction and of sufficient strength. Use threaded steel hanger rods of diameter required to safely support loads. Minimum size hanger rod shall be 3/8”. Install rods through holes drilled in beam flanges, 1½" x 1½" x 8" angles welded to structural members or top cord slot at joist panel points and secure with large washers and nuts. Refer to structural drawing details for additional information. Do not use perforated strap. ***DO NOT USE CONCRETE ANCHORS.***

3. HANGERS: Manufactured by Anvil, Grinnell or Tolco.

a. SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

b. MULTIPLE RUNS: Trapeze hangers.

c. BEAM CLAMPS: Grinnell Figure 92 for smaller pipe

d. BEAM CLAMPS: Grinnell Figure 228 (storm or sanitary 8” and larger)

4. SUPPORT FROM BELOW: All piping near the floor, or where ceiling structure does not have sufficient strength, or where there is no ceiling shall be supported from below. Support members shall be steel pipe with base plates, or welded steel structure suitably braced.

5. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel.

6. PIPE SADDLES: Install 18 gauge, 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, 16” minimum length. Provide compressible gasketing between non-insulated plastic pipe and hangers. Provide insulating material between dissimilar metal.

C. PLUMBING CHASE PIPING: Plumbing piping located in chases and at individual fixtures not located at chases shall be rigidly supported and aligned using the Sumner Pipe Support and Alignment System, Hubbard Holdrite System or Unistrut with U-bolts and pipe clips.

2.03 VALVE INSTALLATION

A. Ball valves shall be installed such that handle for valve is positioned on the side of the pipe and is pulled down to close the valve. Provide access panels of adequate size for concealed valves. Minimum 24" x 24". All valves above a ceiling shall be installed within 24” of the ceiling. All valves shall be located such that there is NO OBSTRUCTION for accessing or operating valve.

2.04 CLEANING DOMESTIC WATER PIPING

A. Flush thoroughly, sterilize with chlorine solution for minimum 24 hours, then flush clean. Strength of chlorine solution, minimum dosage 50 ppm, and methods must comply with local Code and Health Authorities. At completion, there must be no discernible odor. System shall be flushed afterwards until remaining chlorine content is less than 0.2 ppm. Post warnings until sterilization is complete.

B. Final flush: 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.

2.05 TESTING PIPING SYSTEMS

A. GENERAL: Test all piping systems to assure that they are absolutely leak free. Pipe to be insulated shall be proved leak free before pipe is concealed. LTY to witness and approve all testing. If piping is concealed prior to LTY witnessing and approving testing, contractor shall expose entire piping system and re-test piping for LTY to witness and approve.

B. PRESSURE TEST METHOD: Hydraulically test (no air testing allowed) domestic water piping with a minimum test pressure of 150 psig. Maintain pressure for 8 hours. During this test period,

inspect all pipe fittings and accessories in the piping and eliminate all leaks.

C. FINAL TEST: Subject each piping system to its normal operating pressure and temperature for not less than twenty-four hours. The piping systems 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.

2.06 SLEEVES

A. Provide sleeves for all piping passing through walls, floors not on grade and roof slabs. Make sleeves of galvanized pipe and sized to provide clearance of 1/4" around piping or pipe insulation if pipe is insulated. Set end of sleeve flush with the surrounding surface of wall or ceiling in which sleeve is installed. Floor slab sleeves shall extend 3" above floor level. Provide vented sleeves for all gas piping below floor slabs or paved areas. Pipes through grade beams shall be sleeved per structural engineer’s drawings. As a minimum pipe shall be wrapped with 1” thick closed cell pipe insulation.

2.07 PLATES

A. Provide chromium plated wall and ceiling plates for all exposed piping, at point piping passes through walls or ceilings. Plates shall be large enough to completely cover pipe sleeves. On insulated piping, inside diameter of plates shall just exceed outside diameter of pipe covering. Plates may be omitted for pipe sizes larger than 6".

2.08 VALVE AND FITTING SIZES

A. All hand valves, fittings and other piping accessories shall be size of the line in which installed unless specifically indicated otherwise on the Drawings.

2.09 DIELECTRIC UNIONS

A. Provide brass unions at all connections between dissimilar metals, except at final fixture connections, such as galvanized pipe connection to brass water faucet.

1. Brass unions shall be used for water heater connections.

2.10 FITTINGS

A. COPPER: Conform to ANSI Specification B16.22.

2.11 VALVES, STRAINERS AND DEVICES

A. GENERAL: All pressures shown below are minimum working pressures. Provide memory stops for valves used for throttling service.

B. GATE VALVE FOR PLUMBING SYSTEMS: No gate valves shall be used.

C. BALL VALVE FOR PLUMBING SYSTEMS: Bronze body, threaded connection, full port, Teflon seat, stainless steel trim, extension stem for insulation. Nibco T-585-66-LF-EL.

D. BUTTERFLY VALVE FOR PLUMBING SYSTEMS: No butterfly valves shall be used.

E. CHECK VALVE FOR PLUMBING SYSTEMS: 2" and under, 125# bronze body, bronze swing check with Teflon seat, regrinding swing check, screw-in cap, threaded connection; 2½" and over 125# iron body, flanged, bronze trim. Nibco T-413-Y-LF or W-920-W-LF.

F. STRAINERS: Cleanable "Y" pattern, bronze body, solid screw-in cap, 20-mesh stainless steel screen, threaded connections, rated for 200 psig working pressure. Nibco model T-221-B

G. INSULATION PROVISIONS: Valves on insulated lines shall have stems extending through insulation.

H. INSTALLATION: Ball valves shall be installed such that handle for valve is positioned on the side of the pipe and is pulled down to close the valve. All valves above a ceiling shall be installed within 24” of the ceiling.

I. BACKFLOW PREVENTER: Provide Watts Series LF909 (model LF909-QT-S-FS for sizes 2" or smaller, model LF909-LF-S-FDA-FS with ball valves on both ends for sizes larger than 2"). Provide 909AG air gap drain funnel with drain line extension. No other brand or model is acceptable. No substitutions. All backflow preventers shall be installed at 36” AFF unless noted otherwise.

J. ACCEPTABLE MANUFACTURERS: Nibco, Kitz, Milwaukee and Uponor (for Uponor, Propex LF Brass Commercial Ball valve only).

K. With valve installation on PEX piping, provide support at all valves.

2.12 MISCELLANEOUS PIPING

A. GENERAL: Provide all required piping not specifically shown on the drawings but necessary for the proper operation of the systems. Piping materials, methods of installation, fittings, valves, etc., shall conform, in general, to that specified for similar piping systems.

B. PLUMBING CONNECTIONS: Make all required connections between HVAC Systems and Plumbing Systems. Pipe extensions to equipment shall be same materials as supply pipe (i.e. copper water lines will be copper to point of connection to equipment). Provide valves at each and every connection between Plumbing and HVAC Systems.

C. TRAP PRIMER PIPING: Use Uponor PEX-A piping with corrugated sleeve only. Piping in contact with concrete shall be installed in protective sleeve.

D. MISCELLANEOUS DRAINS: Provide drain line to floor drain from backflow preventers, relief valves and other plumbing equipment with automatic drains.

E. Hose bibbs and trap primer assemblies are not to be located any closer than 5' from any electrical equipment.

2.13 ROUGH-INS AND CONNECTIONS

A. SPECIAL FIXTURES AND TRIM: Provide rough-ins and connections to cabinet sinks and all trim where shown on the Drawings. Fixtures and trim requiring rough-ins and connections will be furnished loose under the special equipment section of those specifications, installation shall be under this Section. Refer to Architectural Specifications for information on prefab cabinets. Provide stops, risers and P-traps under this Section for prefab cabinets and kitchen equipment provided under the Architectural Specifications.

B. COORDINATION: The piping and connections for these areas have been indicated approximately. The exact arrangements and locations of various piping and connections shall be determined by shop drawings provided under other sections of these Specifications.

PART 3 – MATERIALS

3.01 EXTERIOR DOMESTIC WATER

A. GENERAL: This paragraph relates to all water piping below grade, all piping above grade outside of building and piping in contact with concrete.

B. MATERIALS:

1. PIPING: Type "K" copper rigid water tubing per ASTM B-42 and ASTM B-88,

   a. ABOVE GROUND: Provide solder type ASME B 16.18 cast bronze, or ASTM B 16.22 wrought copper alloy fittings, made up with lead-free solder. Solder shall be 95.5% tin, 4% copper, 0.5% silver (lead free, antimony free, zinc-free). Silvabrite 100 by Engelhard Corporation or approved equal. Piping in contact with concrete shall be protected with Benjamin Foster 60-25 mastic or be PVC coated.

   b. IN GROUND: Provide brazed connections for all exterior copper piping installed below ground.

2. MISCELLANEOUS REQUIREMENTS: Connections at water meter shall be as specified by the water district or water department. The 30 feet of piping ahead of the building service shutoff valve shall be Type "K" copper rigid water tubing with sweat fittings and lead-free solder. Install 2" diameter by 6" long capped tee above grade ahead of shutoff valve for electrical grounding use. Install concrete anchors below grade as recommended by the piping manufacturer.

C. EXECUTION:

1. The installing contractor shall examine the copper tubing and fittings for defects, sand holes or cracks. There shall be no defects of the tubing or fittings. Any damaged tubing or fittings shall be rejected.

2. The installing contractor shall insure that sealing elements are properly in place and free from damage. For Sizes 2-1/2” to 4”, installer should insure that the stainless steel grip

ring is in place.

3. Copper tubing shall be cut with a wheeled tubing cutter or approved copper tubing cutting tool. The tubing shall be cut square to permit proper joining with the fittings.

4. Remove scale, slag, dirt and debris from inside and outside of tubing and fittings before assembly. The tubing end shall be wiped clean and dry. The burrs on the tubing shall be reamed with a deburring or reaming tool.

5. Solder Joints: Solder joints shall be made in accordance with ASTM B 828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.

D. TESTING: Test in accordance with recommendations of AWWA.

3.02 INTERIOR DOMESTIC WATER

A. GENERAL: This paragraph relates to all piping inside of building.

B. MATERIALS:

1. Hard drawn, copper water tube, Type "L" per ASTM B-88 and ANSI/NSF Standard 61, with solder type ASME B 16.18 cast bronze, or ASTM B 16.22 wrought copper alloy fittings, made up with lead-free solder.

   a. Applies to all above slab piping anywhere other than directly above lay-in ceilings, including all piping in walls, in mechanical rooms, and above hard ceilings

   b. Solder shall be 95.5% tin, 4% copper, 0.5% silver (lead free, antimony free, zinc-free). Silvabrite 100 by Engelhard Corporation or approved equal.

   c. Grooved or press type fittings shall not be acceptable.

   d. All individual branches serving fixtures, from surface of walls to connections to fixtures or equipment, shall be chrome plated.

   e. Use brass or stainless steel threaded X solvent weld fittings when transitioning from CPVC to copper.

2. Pressure-rated Schedule 80 Fire-rated (25/50) CPVC certified by the NSF as suitable for potable water applications and marked accordingly if the authority having jurisdiction will allow it. CPVC piping and fittings shall be manufactured in the United States by Georg Fischer, Spears or Harvel Plastics. CPVC piping shall be installed and supported per the manufacturer’s requirements as well as any and all Code requirements. Valves, strainers and devices installed in CPVC piping shall have threaded brass MIP transition fittings (NSF certified for potable water and no lead) installed on both ends of valve. Where CPVC piping is used, piping shall be installed per manufacturer’s installation instructions. Where the Contract Documents (Drawings and Specifications) or applicable codes conflict with the manufacturer’s installation instructions, the more stringent of the requirements shall be used by the Contractor. This includes any and all aspects

pertaining to the use and installation of CPVC piping for this particular application (i.e. protection of pipe, backfilling requirements, primer, cement, pipe supports, spacing of pipe supports, installation procedures, everything). Assembly of pipe and fittings, including connections to other types of pipe shall be done by solvent cementing, threading or flanging – install per manufacturer's requirements.

a. Applies only to piping directly above lay-in ceilings.

b. All piping connections shall be cleaned and primed before cement is applied

c. CPVC solvent cement and primer by Oatey or IPS.

d. All piping branches to fixtures, chases, mechanical rooms, etc. shall transition within12" of the main.

e. Acceptable Manufacturers:

1) Georg Fischer Harvel

2) Spears

3. PEX-A pipe and fittings (3" and smaller) above ceilings, in walls and chases. Cold expansion PEX-A pipe with reinforcing ring. Provide hanger spacing as recommended by the manufacturer. Provide shielding as recommended by the manufacturer.

a. Acceptable manufacturers: Uponor only (No Substitutions)

b. All PEX piping to be rigid type except where installed under slab for trap primer and island water connections.

c. All trap primer lines shall be routed in Uponor PEX piping and installed in sleeve.

d. No trap primers shall be installed above ceilings under any circumstances. No joints below slab.

e. Do not use shark bite fittings for installation.

f. Use copper stub outs for water closets and sinks.

g. Do not install PEX in any exposed areas, including but not limited to, kitchens and mechanical spaces. Provide copper piping for exposed installations.

h. All installers to have certification from Uponor.

i. Entire installation in return air plenum space to be insulated to comply with 25/50 smoke/fire ratings.

j. Entire installation to be supported with PEX-a pipe support with 8' maximum intervals.

k. Do not install in heated water systems with temperatures above 140° F.

l. See valve specifications for acceptable manufacturers.

C. EXECUTION:

1. The installing contractor shall examine the tubing and fittings for defects, sand holes or cracks. There shall be no defects of the tubing or fittings. Any damaged tubing or fittings shall be rejected.

2. The installing contractor shall insure that sealing elements are properly in place and free from damage. For Sizes 2-1/2” to 4”, installer should insure that the stainless steel grip ring is in place.

3. Copper tubing shall be cut with a wheeled tubing cutter or approved copper tubing cutting tool. The tubing shall be cut square to permit proper joining with the fittings.

4. Remove scale, slag, dirt and debris from inside and outside of tubing and fittings before assembly. The tubing end shall be wiped clean and dry. The burrs on the tubing shall be reamed with a deburring or reaming tool.

5. Solder Joints: Solder joints shall be made in accordance with ASTM B 828. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.

D. WATER HAMMER ARRESTERS: Threaded arrestors only. Provide on both hot and cold water branches. Arresters to be Precision Plumbing Products, Inc. or Sioux Chief, size and location to be based on pipe size, fixture unit count and manufacturer’s recommendation. Install according to the Plumbing Riser Diagrams. Sizes shown on Riser Diagrams are PDI sizes. Units shall have 3-year warranty and shall require an 8" x 8" access panel.

E. VALVING:

1. Provide valve in branch line to each piece of water consuming equipment or fixture.

2. Generally, stop valves serving fixtures are specified in Plumbing Fixtures Section 22 42 00.

3. Valves not specified under Plumbing Fixtures, but to be located exposed to view, shall be chrome plated.

END OF SECTION 22 11 16

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide all accessories and specialties indicated on the Contract Drawings, as specified, and as required under Section General Plumbing.

PART 2 – MATERIALS AND METHODS

2.01 SPECIALTIES

A. HYDRANTS & HOSE BIBBS: See Schedule on Drawings.

1. Hose bibbs shall be located minimum 5' from an electrical equipment or panels.

2. Wall hydrants shall be by Zurn or Wade only.

B. VACUUM BREAKERS: Provide where required by Plumbing Code or shown on Plans, female inlet and outlet, polished chrome plated vacuum breakers, full size of line. PPP or Sioux Chief only.

C. WATER HAMMER ARRESTERS: Provide on both hot and cold water branches. Arresters to be Precision Plumbing Products, Inc. or Sioux Chief, size and location to be based on pipe size, fixture unit count and manufacturer’s recommendation. Install according to the Plumbing Riser Diagrams. Sizes shown on Riser Diagrams are PDI sizes. Units shall have 3-year warranty and shall require an 8" x 8" access panel.

1. For fixtures installed adjacent to lay-in ceilings, hammer arrester and valves shall be installed above and within 24" of ceiling.

D. VACUUM RELIEF VALVES:

1. GENERAL: Provide on each water heater in cold water inlet connection.

2. RATING: AGA certified, 3/4", 21.5 CFM opens at less than 1/2" vacuum, 200 pounds and 250° F.

3. MODEL: Watts No. 36A.

4. ACCEPTABLE MANUFACTURERS: Cash, McDonnell-Miller and Watts

E. HOT WATER CIRCULATING PUMP:

1. TYPE: In-the-line, all bronze or stainless steel construction, designed for domestic water pumping, certified by manufacturer to be suitable for frequent on/off cycling. Manufactured by Grundfos

2. MOTOR: Single phase, 120 volt, 1750 RPM, ½ HP with built-in overload protection, non-overloading throughout pumping range.

3. CAPACITY: Refer to Plumbing Drawings.

4. ACCEPTABLE MANUFACTURERS: Bell and Gossett PL Series, Grundfos (stainless steel) or Taco cartridge type circulator. Refer to Motors and Starters under Miscellaneous Equipment and Requirements Section.

5. CONTROL: Honeywell L6008C, 40° - 180° range, immersion aquastat. Mount in return line to cycle pump.

F. HOT WATER BALANCING STATION: None.

G. ELECTRONIC TRAP PRIMER MANIFOLDS: PPP or Jay R Smith

1. Trap primer manifolds shall be located minimum 5' from any electrical equipment or panels in mechanical or custodial rooms only.

2. Trap primer manifold shall be 5' above finished floor.

3. Provide minimum 4" concrete curb above slab where trap primer piping penetrates slab for protection of trap primer piping.

4. Provide ball valve strainer and union for domestic water connection to unit.

H. Sub-meters

1. Able to be installed in horizontal, vertical, or inclined positions without affecting accuracy.

2. Require no calibration througout lifespan.

3. Flow rates starting at 0.5 gpm.

4. Compatible with automatic meter reading systems.

5. Honeywell model V300 or approved equal.

END OF SECTION 22 11 19

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops. Piping shown underground shall be buried a minimum of 12 inches to top of pipe. Piping in the vicinity of equipment shall be arranged to not interfere with access panels and maintenance space.

B. Piping shall be concealed in wall, chases and above ceilings except in mechanical rooms. All materials shall conform with the City Building Code.

C. All below grade non-metallic, non-conducting pipe not under building slab shall have a tracer wire installed parallel to pipe. Tracer wire shall be a 14 gage, solid copper wire with PVC jacket with all joints and splices sealed water-tight. Carry end of wire up through slab and terminate in an accessible location. Provide identification label attached to wire.

D. All piping, fittings and valves shall be manufactured in the United States of America by Tyler or Charlotte Pipe. Do not mix and max manufacturers on project. All piping and fittings shall be from same manufacturer (Tyler or Charlotte Pipe).

E. Provide pipe markers and valve tags per Section 22 05 53 Identification of Plumbing Piping and Equipment.

F. After installation and before final inspection, all sanitary piping shall be rodded out to ensure there are no obstructions in the pipe and the systems are free flowing.

PART 2 - METHODS

2.01 EXCAVATION AND BACKFILLING

A. GENERAL: Provide all excavation and backfilling required for the proper installation of all underground piping and other components installed below grade.

B. EXCAVATION: Trench with ladder type trenching machine. Make trenches 12" to 18" wider than outside diameter of pipe. Excavate, backfill and grade trench bottom to required slope. Verify slope with laser level or approved device. Cut out bedding for pipe joints to provide solid bearing surface for entire length of pipe. Backhoe may be used to excavate trench if bottom is properly sloped and compacted to proper grade prior to installation of the piping.

C. BACKFILLING:

1. Backfill for pipe in City Property must comply with City requirements. Also, if Architect's or Structural Engineer's backfill requirements are more stringent, Contractor shall comply with whatever requirements are the most stringent.

2. For drainage lines, provide cement-stabilized sand bed to 6" below bottom of pipe with top surface shaped to accommodate pipe including joints, at the proper flowline. Grading shall be determined by laser level. After installation of the pipe, backfill to 4" above top of pipe with cement stabilized sand. Entire pipe shall be surrounded on all sides by minimum 4" of cement stabilized sand. The remainder of the excavation shall be backfilled with approved backfill material to 95% standard proctor, by hand compaction. Do not place backfill material or second layer of cement stabilized sand until the piping and joints have been inspected and approved.

3. Cement stabilized sand shall be 1.5 sacks cement per ton of sand with MINIMUM 160 psi compressive strength at 48 hours.

D. BENTONITE DAM:

1. Bentonite trench dams must be installed across the entire trench, including below the pipe, from the foundation wall to 5 feet outside of building.

2. Required locations: At all trenches 8" in width or wider which cross the building foundation perimeter grade beam (outside to inside the building footprint), provide a trench dam comprised of sodium bentonite. No additives permitted.

3. Bentonite trench dams shall be 6" wider than the pipe trench on each side, 6" below the pipe trench bottom, 1'-0" above the bottom of the grade beam, and directly adjacent to the foundation wall / grade beam outside the building foundation. Trench dam shall completely fill the trench around the pipe. Bentonite trench dams shall be 12" thick unless otherwise noted.

E. SAFETY SYSTEMS: Refer to Architectural Sections for additional requirements.

2.02 PIPE SUPPORTS

A. GENERAL: Provide pipe supports and guides of size and type to support pipe as well as limit movement. Minimum size hanger rod shall be 3/8". Pipe support material shall be selected to be compatible with the pipe material to prevent galvanic corrosion. Vertical cast iron pipe shall supported per the cast iron manufacturers recommendations.

B. HORIZONTAL PIPING:

1. SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than below:

Pipe Size	Iron Pipe	CPVC Pipe	Other Pipe
1" & Smaller	6 Feet	3 Feet	4 Feet
1¼" & 1½"	8 Feet	4 Feet	5 Feet
2"	8 Feet	4 Feet	5 Feet
2½" to 4"	8 Feet	4 Feet	6 Feet

6" and Larger	8 Feet	4 Feet	6 Feet

2. SUPPORT FROM ABOVE: Support piping near roof or upper floor from structure if sufficient strength exists. Use a method suitable for type of construction and of sufficient strength. Use threaded steel hanger rods of diameter required to safely support loads. Minimum size hanger rod shall be 3/8”. Install rods through holes drilled in beam flanges, 1½" x 1½" x 8" angles welded to structural members or top cord slot at joist panel points and secure with large washers and nuts. Refer to structural drawing details for additional information. Do not use perforated strap. ***DO NOT USE CONCRETE ANCHORS.***

3. HANGERS: Manufactured by Anvil, Grinnell or Tolco.

   a. SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

   b. MULTIPLE RUNS: Trapeze hangers.

   c. BEAM CLAMPS: Grinnell Figure 92 for smaller pipe.

      1) Do not use beam clamps on bar joists.

   d. BEAM CLAMPS: Grinnell Figure 228 (storm or sanitary 8” and larger).

      1) Do not use beam clamps on bar joists.

4. SUPPORT FROM BELOW: All piping near the floor, or where ceiling structure does not have sufficient strength, or where there is no ceiling shall be supported from below. Support members shall be steel pipe with base plates, or welded steel structure suitably braced.

5. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel. Provide hot dipped copper clad supports for copper piping.

6. PIPE SADDLES: Install 18 gauge, 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, 16” minimum length. Provide compressible gasketing between non-insulated plastic pipe and hangers. Provide insulating material between dissimilar metal.

7. SWAY BRACING: All horizontal no-hub cast iron piping larger than 4” shall have sway bracing per the manufacturer’s recommendations.

2.03 TESTING PIPING SYSTEMS

A. GENERAL: Test all piping systems to assure that they are absolutely leak free. Test for sanitary piping shall include the first fitting above slab (i.e. transition fitting between underground PVC and cast iron).Pipes that will contain water or sewage shall be leak tested with water. Pipe to be insulated shall be proved leak free before pipe is concealed. LTY Engineers (LTY) to witness and approve all testing. If piping is concealed prior to LTY witnessing and approving testing, contractor shall expose entire piping system and re-test piping for LTY to witness and approve.

B. PRESSURE TEST METHOD: For drainage systems, plug outlet and fill piping with water to top of vent. System shall remain plugged and filled with water until after system below grade is backfilled and compacted per specification. Multistory systems shall be tested one floor at a time at ten feet of hydrostatic head with out leaks. Maintain pressure for 8 hours. During this test period, inspect all pipe fittings and accessories in the piping and eliminate all leaks.

C. UNDERGROUND PIPE TESTING AND INSPECTION

1. Initial open trench underground piping tested to 10-foot head for 8 hours, as always. LTY to inspect pipe installation, approve/reject test, approve for backfill.

2. Pipe to remain full of water through backfill, compaction and concrete pour of slab.

3. After backfill and compaction, pipes to be topped off for 10-foot head to account for evaporation. New water level to be marked and dated on pipe.

4. Prior to concrete pour, Architect's CA (already on site for concrete pour) and Contractor to check water levels and Architect's CA to approve/reject test for concrete pour.

5. After concrete is poured and dry, Architect's CA or LTY to check water levels and approve/reject pipe tests accordingly. Test shall not be removed until approval is granted by A/E team.

6. If water drops or is released prior to A/E review after concrete is placed then an investigation will begin immediately by the sub and GC to locate the problem. If issue is determined to be a leak then it must be located, concrete removed, corrections made, pipe re-tested and water from test left on until after re-compaction and concrete placement.

D. FINAL TEST: Test underground PVC sanitary drainage piping for physical deformation by passing a mandrel of 95% pipe inside diameter through piping 8" and larger. Just prior to substantial complete, contractor shall smoke test all sanitary and vent piping to confirm that the piping system is complete, access cleanouts are properly installed and all joints are tight. Contractor shall use a commercial smoke generating machine with fan to pressurize the system with smoke Smoke generating machine to be Hurco Plumbing Smoke Tester or equal. Test shall be witnessed by Owner's Representative and the A/E inspectors. Both Owner and LTY must approve smoke testing of sanitary and vent systems before substantial completion can be granted.

E. UNDERGROUND PIPE CLEANING AND CERTIFICATION: All underground sanitary sewer piping shall be hydro-flushed or rodded all the way to the sanitary manhole that the system is connected to prior to substantial completion. After cleaning, contractor shall provide 3rd-party subcontractor to camera and video tape inside of all underground sanitary sewer piping all the way to the sanitary manhole that the system is connected to, and provide video tape as well as detailed report outlining quality of installation and noting exact areas of poor installation. Contractor shall repair all areas noted as problems and re-camera/video tape those areas to confirm proper installation at no cost to the Owner.

2.04 SLEEVES

A. Provide sleeves for all piping passing through walls, floors not on grade and roof slabs. Make sleeves of galvanized pipe and sized to provide clearance of 1/4" around piping or pipe insulation if pipe is insulated. Set end of sleeve flush with the surrounding surface of wall or ceiling in which sleeve is installed. Floor slab sleeves shall extend 3" above floor level. Pipes through grade beams shall be sleeved per structural engineer's drawings. As a minimum pipe shall be wrapped with 1" thick closed cell pipe insulation.

2.05 PLATES

A. Provide chromium plated wall and ceiling plates for all exposed piping, at point piping passes through walls or ceilings. Plates shall be large enough to completely cover pipe sleeves. On insulated piping, inside diameter of plates shall just exceed outside diameter of pipe covering. Plates may be omitted for pipe sizes larger than 6".

2.06 DIELECTRIC UNIONS

A. Provide dielectric insulating unions at all connections between dissimilar metals.

2.07 FLASHINGS

A. Provide flashings for all vent pipes.

B. Flashings shall be constructed of 4 lbs./s.f. sheet lead, with bases extending not less than 10" on each side of pipe. The vertical portion of flashings shall extend upward entire length of the pipe and be turned down inside of pipe at least 2", unless vent caps are used. Minimum size flashing sheet is 36" x 36". Flashings shall be compatible with the roof system specified by the Architect.

2.08 ROUGH-INS AND CONNECTIONS

A. SPECIAL FIXTURES AND TRIM: Provide rough-ins and connections to cabinet sinks and all trim where shown on the Drawings. Fixtures and trim requiring rough-ins and connections will be furnished loose under the special equipment section of those specifications, installation shall be under this Section. Refer to Architectural Specifications for information on prefab cabinets. Provide stops, risers and P-traps under this Section for prefab cabinets and kitchen equipment provided under the Architectural Specifications.

B. COORDINATION: The piping and connections for these areas have been indicated approximately. The exact arrangements and locations of various piping and connections shall be determined by shop drawings provided under other sections of these Specifications.

PART 3 - MATERIALS

3.01 SANITARY SOIL, WASTE AND VENT PIPING

A. GENERAL: Provide for all fixtures, equipment and floor drains as indicated and as required by Code. Provide appropriate wye fittings and bends. Sanitary crosses and double-combination fittings are prohibited. Do NOT install these types fittings. Do not use any fittings prohibited by the codes. All piping shall be manufactured by Charlotte or Tyler Pipe. Do not mix pipe

manufacturers on project. All piping shall comply with ASTM D1785/D2665.

B. MATERIALS:

1. ABOVE SLAB:

a. Standard weight, no hub piping with no hub clamps. Install with proper pipe supports per manufacturers recommendations are installed to maintain uniform slope and rigidity – supports shall be installed on both sides and within 18” of each hub. Heavy weight, medium duty no-hub clamps shall be installed on all sanitary piping and vent piping.

b. Schedule 40 Fire-rated (25/50) DWV CPVC piping. CPVC piping and fittings shall be manufactured in the United States by Georg Fischer Harvel or Spears. When transitioning from PVC to CPVC pipe, use Spears LW-5 CPVC solvent only. CPVC piping shall be installed and supported per the manufacturer’s requirements as well as any and all Code requirements.

2. BELOW SLAB: Schedule 40, DWV PVC. Refer to 2.1 for backfilling requirements.

a. For grease waste and vent below slab: Schedule 40 DWV CPVC piping. CPVC piping and fittings shall be manufactured in the United States by Georg Fischer Harvel or Spears. When transitioning from CVPC to PVC pipe, use Spears LW-5 CPVC solvent only. CPVC piping shall extend to above slab.

3. BELOW GRADE, BEYOND FIVE FEET FROM BUILDING: Schedule 40, DWV PVC or standard weight, bell and spigot cast iron with Ty-Seal joints. Sizes over 6" may be heavy wall SDR-26 PVC sewer pipe meeting ASTM D3034 requirements. Refer to 2.1 for backfilling requirements.

4. Where CPVC piping is used, piping shall be installed per manufacturer’s installation instructions. Where the Contract Documents (Drawings and Specifications) or applicable codes conflict with the manufacturer’s installation instructions, the more stringent of the requirements shall be used by the Contractor. This includes any and all aspects pertaining to the use and installation of CPVC piping for this particular application (i.e. protection of pipe, backfilling requirements, primer, cement, pipe supports, spacing of pipe supports, installation procedures, everything). Assembly of pipe and fittings, including connections to other types of pipe shall be done by solvent cementing, threading or flanging – install per manufacturer’s requirements.

C. GASKETS: No-hub joints shall be made with gasket and one piece stainless steel, heavy weight, medium duty no-hub clamps. No-hub clamps for pipes 6” and larger shall have 6 bands, 4 band for sanitary under 6". Clamps for sanitary piping shall be Husky 4000 or MiFab MI-XHUB. Clamps for vent piping shall be Husky 2000 or MiFab MI-XHUB.

D. DWV PVC to CAST IRON TRANSITION: Where PVC to Cast Iron transition fittings are installed, provide Husky SD 4200 with one-piece neoprene gasket with 4 bands. No other coupling shall be used for these transitions.

E. CLEANOUTS: Install at each change of direction and at locations indicated on drawings. Exact location to be reviewed by Architect prior to setting. Shall be size of the line served, except

maximum size of 4". Provide double cleanout for two-way rodding after each pipe exits the building. Wall cleanouts behind access panels shall be within 2” of the panel for ease of use and shall be installed above flood level rim of adjacent plumbing fixtures.

F. DRAINS: Floor drains installed in floors, with waterproofing membranes, to have clamping collars.

G. GRADING: Continuously grade all drainage piping. Inside building, grade 1/4" per foot for lines 3" and smaller. Grade 1/8" per foot for line 4" and larger. Piping below grade beyond five feet from building shall have maximum continuous slope consistent with site conditions of existing mains to which they will be connected or 1/8" per foot whichever is less (1/4" per foot for lines smaller than 4").

H. PROVE FREE FLOWING: Hydroflush or rod out all sections of sanitary waste lines prior to substantial completion.

I. APPROVED MANUFACTURERS:

1. CPVC

    a. Georg Fischer Harvel

    b. Spears

2. PVC

    a. Charlotte

    b. Tyler

END OF SECTION 22 13 16

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide all fixtures, drains, equipment, accessories and specialties indicated on the Contract Drawings, as specified, and as required under Section General Plumbing.

B. In addition to the manufacturers listed, equipment of identical design, quality and appearance will be considered when of the following manufactures:

1. FLOOR DRAINS, CLEANOUTS AND CARRIERS: J.R. Smith, Wade or Zurn. Do not mix manufacturers on project. All drains, cleanouts and fixture carriers shall be from the same approved manufacturer, except for floor sinks which shall be from Wade only.

PART 2 - MATERIALS AND METHODS

2.01 FLOOR DRAINS

A. GENERAL: See Plumbing Drawings for model numbers. All floor drains shall be trap primed. Trap guards shall NOT be acceptable. All floor floor drains shall have 1/2" trap primer connection integral to drain body.

B. TOILET ROOMS, LOCKER ROOMS, SHOWER AREAS AND SIMILAR LOCATIONS: Cast iron two-piece floor drain with seepage flange, reversible clamping collar, 6" diameter, heavy duty stainless steel strainer, 1/2" trap primer tap. BAP adapters shall NOT be acceptable for floor drains installed on first floor.

C. EQUIPMENT CONDENSATE DRAINS: Cast iron, medium depth floor drain with flange, clamping device, seepage openings with 12” stainless steel rim, less top grate but with internal ductile iron sediment bucket and 1/2" trap primer tap – drain designed to not allow installation of grate without installation of sediment bucket.

D. GRATED EQUIPMENT DRAINS: Cast iron floor drain with flange, seepage openings, 9” heavy duty ductile iron grate with stainless steel veneer, clamping device and 1/2" trap primer tap.

E. KITCHEN: Cast iron two-piece floor drain with seepage flange, reversible clamping collar, 7" stainless steel strainer with tractor grate, riser and 1/2" trap primer tap. Provide 4” diameter stainless steel funnel at indirect waste connections.

F. SANITARY FLOOR SINK: Cast iron floor sink with 8” sump, 12"x12" acid resisting enamel coated interior, heavy duty stainless steel frame and 3/4 tractor grate, ductile iron secondary dome strainer, integral flange with seepage openings for support, clamping device and 1/2" trap primer

tap.

2.02 CLEANOUTS

A. GENERAL: Install cleanouts at bends, angles, and at ends of all waste and sewer piping and as noted on Drawings. Bring all cleanouts up to grade and make accessible. All cleanouts shall have extra heavy PVC plugs. For cleanouts in unpaved areas, install in 18" x 18" x 6" thick concrete pad. The top of cleanout shall be 2” above grade with the pad sloping to edges at grade level. For cleanouts in paving, sidewalks, etc., install flush with finished surface. Refer to detail on Architectural Drawings. See Plumbing Drawings for model numbers.

B. MATERIALS:

1. UNFINISHED AREAS AND CHASES: Cast iron caulking ferrule with countersunk head with PVC plug.

2. FINISHED WALLS: Cast iron caulking ferrule with countersunk slotted head with PVC plug (full size up to 4”). Provide square smooth finish, 8”x8”, 16 gauge stainless steel, vandal-proof access cover, flanged frame with anchoring lugs. Also provide flanged frame for pre-finished or CMU walls. Cleanout plug shall be installed within 2” of and centered on access panel. Install wall cleanouts at higher level than the flood level rim of adjacent plumbing fixtures. For urinals, wall cleanouts shall be installed to side of urinal above flood level rim of fixture – coordinate cleanout location with urinal privacy partitions.

3. FINISHED FLOORS: Floor cleanout with adjustable extension housing, cast iron ferrule with PVC plug (full size up to 4”), round scoriated stainless steel, secured, vandal-proof access cover and round frame. Provide top style compatible with floor type. Carpet: - carpet flange (carpet markers will not be acceptable); Terrazzo: - top with terrazzo recess.

4. OUTSIDE AREAS: Extra heavy duty, vandal-proof ductile iron cover, cast iron ferrule for caulk, PVC plug (full size up to 4”) and positioning set screws. In non-surfaced areas these shall be installed in 18" x 18" x 6" thick concrete pad. The top of cleanout shall be 2” above grade with the pad sloping to edges at grade level. Locate as directed by the Architect.

5.

2.03 GREASE TRAPS AND SAMPLE WELLS

A. Provide Park Equipment model as shown on the Drawings, complete with all piping, manhole covers, rims for covers, grates, rim for grates and concrete work.

END OF SECTION 22 13 19

SECTION 22 14 13
STORM DRAINAGE PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops. Piping shown underground shall be buried a minimum of 12 inches to top of pipe. Piping in the vicinity of equipment shall be arranged to not interfere with access panels and maintenance space.

B. Piping shall be concealed in wall, chases and above ceilings except in mechanical rooms. All materials shall conform to the City Building Code and any requirements from the Owner or local authority having jurisdiction..

C. All below grade non-metallic, non-conducting pipe not under building slab shall have a tracer wire installed parallel to pipe. Tracer wire shall be a 14 gage, solid copper wire with PVC jacket with all joints and splices sealed water-tight. Carry end of wire up through slab and terminate in an accessible location. Provide identification label attached to wire.

D. All piping, fittings and valves shall be manufactured in the United States of America by Tyler or Charlotte Pipe. Do not mix and max manufacturers on project. All piping and fittings shall be from same manufacturer (Tyler or Charlotte Pipe).

E. Provide pipe markers and valve tags per Section 22 05 53 Identification of Plumbing Piping and Equipment.

F. After installation and before final inspection, all storm piping shall be rodded out to ensure there are no obstructions in the pipe and the systems are free flowing.

PART 2 - METHODS

2.01 EXCAVATION AND BACKFILLING

A. GENERAL: Provide all excavation and backfilling required for the proper installation of all underground piping and other components installed below grade.

B. EXCAVATION: Trench with ladder type trenching machine. Make trenches 24" wider than outside diameter of pipe. Excavate, backfill and grade trench bottom to required slope. Verify slope with laser level or approved device. Cut out bedding for pipe joints to provide solid bearing surface for entire length of pipe. Backhoe may be used to excavate trench if bottom is properly sloped and compacted to proper grade prior to installation of the piping.

C. BACKFILLING:

1. Backfill for pipe in City Property must comply with City requirements. Also, if Architect's or Structural Engineer's backfill requirements are more stringent, Contractor shall comply with whatever requirements are the most stringent.

2. For storm drainage lines, provide cement-stabilized sand bed to 6" below bottom of pipe with top surface shaped to accommodate pipe including joints, at the proper flowline. Grading shall be determined by laser level. After installation of the pipe, backfill to 12" above top of pipe with cement stabilized sand. The remainder of the excavation shall be backfilled with approved backfill material to 95% standard proctor, by hand compaction. Do not place backfill material or second layer of cement stabilized sand until the piping and joints have been inspected and approved.

3. Cement stabilized sand shall be 1.5 sacks cement per ton of sand with MINIMUM 160 psi compressive strength at 48 hours.

D. BENTONITE DAM:

1. Bentonite trench dams must be installed across the entire trench, including below the pipe, from the foundation wall to 5 feet outside of building.

2. Required locations: At all trenches 8" in width or wider which cross the bilding foundating perimeter grade beam (outside to inside the building footprint), provide a trench dam comprised of sodium bentonite. No additives permitted.

3. Bentonite trench dams shall be 6" wider than the pipe trench on each side, 6" below the pipe trench bottom, 1'-0" above the bottom of the grade beam, and directly adjacent to the foundation wall / grade beam outside the building foundation. Trench dam shall completely fill the trench around the pipe. Bentonite trench dams shall be 12" thick unless otherwise noted.

E. SAFETY SYSTEMS: Refer to Architectural Sections for additional requirements.

2.02 PIPE SUPPORTS

A. GENERAL: Provide pipe supports and guides of size and type to support pipe as well as limit movement. Minimum size hanger rod shall be 3/8". Pipe support material shall be selected to be compatible with the pipe material to prevent galvanic corrosion. Vertical cast iron pipe shall supported per the cast iron manufacturers recommendations.

B. HORIZONTAL PIPING:

1. SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than 8 feet apart for iron pipe and 6 feet apart for PVC.

2. SUPPORT FROM ABOVE: Support piping near roof or upper floor from structure if sufficient strength exists. Use a method suitable for type of construction and of sufficient strength. Use threaded steel hanger rods of diameter required to safely support loads. Minimum size hanger rod shall be 3/8". Install rods through holes drilled in beam flanges, 1½" x 1½" x 8" angles welded to structural members or top cord slot at joist panel points and secure with large washers and nuts. Refer to structural drawing details for additional

information. Do not use perforated strap. DO NOT USE CONCRETE ANCHORS.

3. HANGERS: Manufactured by Anvil, Grinnell or Tolco.

   a. SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

   b. MULTIPLE RUNS: Trapeze hangers.

   c. BEAM CLAMPS: Grinnell Figure 92 for smaller pipe

      1) Do not use beam clamps on bar joists.

   d. BEAM CLAMPS: Grinnell Figure 228 (storm or sanitary 8” and larger)

      1) Do not use beam clamps on bar joists.

4. SUPPORT FROM BELOW: All piping near the floor, or where ceiling structure does not have sufficient strength, or where there is no ceiling shall be supported from below. Support members shall be steel pipe with base plates, or welded steel structure suitably braced.

5. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel. Provide hot dipped copper clad supports for copper piping.

6. PIPE SADDLES: Install 18 gauge, 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, 16” minimum length. Sheet metal saddle shall be secured to pipe insulation using aluminum band at both ends of saddle. Provide compressible gasketing between non-insulated plastic pipe and hangers. Provide insulating material between dissimilar metal.

7. SWAY BRACING: All horizontal no-hub cast iron piping larger than 4” shall have sway bracing per the manufacturer’s recommendations. Install bracing at each roof drain pipe connection.

C. All joints and fittings must be restrain with pipe clamps and straps tightened to 60 ft-lbs torque. Straps shall be minimum 16 gauge galvanized steel. HoldRite #117 series or approved equal.

2.03 TESTING PIPING SYSTEMS

A. GENERAL: Test all piping systems to assure that they are absolutely leak free. Test for storm piping shall include the first fitting above slab (i.e. transition fitting between underground PVC and cast iron). Pipes that will contain water or sewage shall be leak tested with water. Pipe to be insulated shall be proved leak free before pipe is concealed. LTY Engineers (LTY) to witness and approve all testing. If piping is concealed prior to LTY witnessing and approving testing, contractor shall expose entire piping system and re-test piping for LTY to witness and approve.

B. PRESSURE TEST METHOD: For drainage systems, plug outlet and fill piping with water to top of roof drain. System shall remain plugged and filled with water until after system below grade is backfilled and compacted per specification. Multistory systems shall be tested one floor at a time

at ten feet of hydrostatic head with out leaks. Maintain pressure for 8 hours. During this test period, inspect all pipe fittings and accessories in the piping and eliminate all leaks. Testing shall be witnessed by Owner and Lee Truong & Yu Engineers (LTY).

C. UNDERGROUND PIPE TESTING AND INSPECTION

1. Initial open trench underground piping tested to 10-foot head for 8 hours, as always. Architect's CA or LTY to inspect pipe installation, approve/reject test, approve for backfill.

2. Pipe to remain full of water through backfill/compaction and concrete pour.

3. After backfill and compaction, pipes to be topped off for 10-foot head to account for evaporation. New water level to be marked and dated on pipe.

4. Prior to concrete pour, Architect's CA (already on site for concrete pour) and Contractor to check water levels and Architect's CA to approve/reject test for concrete pour.

5. After concrete is poured and dry, Architect's CA or LTY to check water levels and approve/reject pipe tests accordingly. Test shall not be removed until approval is granted by A/E team.

6. If water drops or is released prior to A/E review after concrete is placed then an investigation will begin immediately by the sub and GC to locate the problem. If issue is determined to be a leak then it must be located, concrete removed, corrections made, pipe re-tested and water from test left on until after re-compaction and concrete placement.

D. FINAL TEST: Test underground PVC storm drainage piping for physical deformation by passing a mandrel of 95% pipe inside diameter through piping 8" and larger. Just prior to substantial complete, contractor shall smoke test all roof drain and storm piping to confirm that the piping system is complete, access cleanouts are properly installed and all joints are tight. Contractor shall use a commercial smoke generating machine with fan to pressurize the system with smoke. Test shall be witnessed by Owner's Representative and the A/E inspectors. Both Owner and LTY must approve smoke testing of sanitary and vent systems before substantial completion can be granted.

E. UNDERGROUND PIPE CLEANING AND CERTIFICATION: All underground storm sewer piping shall be hydro-flushed or rodded all the way to the storm manhole, inlet or junction box that the system is connected to prior to substantial completion. After cleaning, contractor shall provide 3rd-party subcontractor to camera and video tape inside of all underground storm sewer piping all the way to the storm manhole, inlet or junction box that the system is connected to, and provide video tape as well as detailed report outlining quality of installation and noting exact areas of poor installation. Contractor shall repair all areas noted as problems and re-camera/video tape those areas to confirm proper installation at no cost to the Owner.

2.04 SLEEVES

A. Provide sleeves for all piping passing through walls, floors not on grade. Make sleeves of galvanized pipe and sized to provide clearance of 1/4" around piping or pipe insulation if pipe is insulated. Set end of sleeve flush with the surrounding surface of wall or ceiling in which sleeve is

installed. Floor slab sleeves shall extend 3" above floor level. Pipes through grade beams shall be sleeved per structural engineer's drawings. As a minimum pipe shall be wrapped with 1" thick closed cell pipe insulation.

2.05 PLATES

A. Provide chromium plated wall and ceiling plates for all exposed piping, at point piping passes through walls or ceilings. Plates shall be large enough to completely cover pipe sleeves. On insulated piping, inside diameter of plates shall just exceed outside diameter of pipe covering. Plates may be omitted for pipe sizes larger than 6".

2.06 DIELECTRIC UNIONS

A. Provide dielectric insulating unions at all connections between dissimilar metals.

PART 3 - MATERIALS

3.01 STORM DRAINAGE, INSIDE BUILDING

A. GENERAL: Provide roof drains, drains, flashings and piping extending from drains to five feet outside of building. All piping shall be manufactured by Charlotte or Tyler Pipe. Do not mix pipe manufacturers on project. Do not use double combination fittings, sanitary crosses or any fittings prohibited by Code. All piping shall comply with ASTM D1785/D2665.

B. MATERIALS:

1. ABOVE SLAB:

a. Standard weight, no hub piping with no hub clamps conforming with CISPI 301 and ASTM A888. Install with proper pipe supports per manufacturers recommendations are installed to maintain uniform slope and rigidity – supports shall be installed on both sides and within 18" of each hub. Heavy weight, medium duty no-hub clamps shall be installed on all sanitary piping and vent piping.

b. Schedule 80 Fire-rated (25/50) DWV CPVC piping if the City of Houston and the City of Pasadena will allow it. CPVC piping and fittings shall be manufactured in the United States by Georg Fischer, Nibco, IPEX, Spears or Harvel Plastics. When transitioning from PVC to CPVC pipe, use Spears LW-5 CPVC solvent only. CPVC piping shall be installed and supported per the manufacturer's requirements as well as any and all Code requirements.

2. BELOW SLAB:

a. Schedule 40, DWV PVC.

1) Refer to 2.01 for backfilling requirements.

C. GASKETS: No-hub joints shall be made with gasket and one piece stainless steel, heavy weight, medium duty no-hub clamps. No-hub clamps for pipes 6" and larger shall have 6 bands. Clamps

for storm piping shall be Husky 4000 or MiFab MI-XHUB.

D. DWV PVC to CAST IRON TRANSITION: Where PVC to Cast Iron transition fittings are installed, provide Husky SD 4200 with one-piece neoprene gasket. No other coupling shall be used for these transitions.

E. INSTALLATION: Continuously grade down in direction of flow 1/8" per foot. Piping below grade shall have maximum continuous slope consistent with the site conditions of existing mains to which they will be connected.

F. PROVE FREE FLOWING: Hydroflush or rod out all sections of storm drain lines prior to substantial completion.

3.02 STORM DRAINAGE, OUTSIDE BUILDING

A. GENERAL: Refer to Civil Engineering Drawings for location of storm tie-ins. Plumbing subcontractor shall extend building storm piping to the storm tie-ins that are provided by site subcontractor.

B. MATERIALS: Schedule 40 PVC. All piping shall be manufactured by Charlotte or Tyler Pipe. Do not mix pipe manufacturers on project. Do not use double combination fittings, sanitary crosses or any fittings prohibited by Code. All piping shall comply with ASTM D1785/D2665.

C. INSTALLATION: Continuously grade down in direction of flow 1/8" per foot. Piping below grade shall have maximum continuous slope consistent with the site conditions of mains to which they will be connected.

D. PROVE FREE FLOWING: Hydroflush or rod out all sections of storm drain lines prior to substantial completion.

END OF SECTION 22 14 13

SECTION 22 14 26
ROOF DRAINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide all fixtures, drains, equipment, accessories and specialties indicated on the Contract Drawings, as specified, and as required under Section General Plumbing.

B. In addition to the manufacturers listed, equipment of identical design, quality and appearance will be considered when of the following manufacture:

C. ROOF DRAINS: J.R. Smith, Wade or Zurn – same manufacturer as floor drains, cleanouts and fixture carriers (do not mix manufacturers of products on project).

PART 2 - MATERIALS AND METHODS

2.01 ROOF DRAINS

A. GENERAL: Wade 3000 Series, adjustable cast iron roof drain with no hub connection. Provide heavy duty, vandal proof, galvanized, cast iron mushroom dome strainer and flashing rim with integral gravel stop, all secured with non-corrosive clamping units and vandal-proof locking mechanism that includes stainless steel, vandal proof hardware. ***ROOF DRAINS SHALL NOT HAVE ANY GASKET OR OTHER TYPES OF WATER SEALING COMPONENTS BELOW THE ROOF FLASHING LINE*** – models that do not comply with this requirement will not be allowed. Where no-hub coupling at drain connection is not accessible due to roof thickness, provide deep sump roof drain to allow accessibility of coupling for maintenance purposes. If deep sump still does not allow coupling to be accessible, provide threaded-to-no-hub pipe extension of required length so that coupling is accessible.

B. ACCESSORIES:

1. Adjustable extension collar for insulated roof (where required)
2. Bearing pan with Securing Package and underdeck clamp (where required)
3. 2” water dam for overflow drains
4. Vandal-proof, galvanized cast iron dome
5. Galvanized Top-Plate/Deck Assembly (where required)

END OF SECTION 22 14 26

SECTION 22 34 13
INSTANTANEOUS TANKLESS GAS DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Indoor Tankless Gas Water Heaters.

1.02 DEFINITIONS

A. Tankless Gas Domestic Water Heater: Internally or externally mounted, or freestanding, commercial condensing, multiple point-of-use, gas fired water heater.

1.03 SUBMITTALS

A. Submit in accordance with requirements of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's technical data sheets, specifications, performance data and installation instructions for all products referenced in the scope of work defined in this section.

C. Shop Drawings: Submit shop drawings required to depict the requirements for fabrication and installation. Include the following drawings as applicable:

1. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

2. Include heat-exchanger dimensions, size of tappings, and performance data.

1.04 CLOSEOUT SUBMITTALS

A. Provide original manufacturer’s installation and operation manuals.

B. Provide written manufacturer’s warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Primary products in this section to be provided by a manufacturer with no less than five years of experience producing the products specified in this section at a facility in the United States.

B. Installer's Qualifications: All work specified in this section is to be completed by a firm with demonstrated experience installing systems similar in scope and complexity to those specified.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and products in accordance with the manufacturer's instructions and recommendations and industry standards.

B. Store all materials in the manufacturer’s original packaging until ready for installation. Protect all products from damage or exposure to adverse environmental conditions, including weather, humidity, and dust.

C. Provide temporary inlet and outlet caps, maintain caps in place until installation.

1.07 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.

1.08 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to replace products that fail within the specified warranty period.

1. Failure Methods: Condensate corrosion, thermal stress, mechanical defects, or workmanship.

2. Heat Exchanger: 15 years from date of Substantial Completion under standard or controlled regulation.

3. All Other Parts and Components: 5 years from date of Substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturer: Navien Inc. only.

2.02 PERFORMANCE REQUIREMENTS

A. Certifications: Provide products with heat exchanger that has the following certification labels.

1. ANSI and CSA marks for the United States and Canada.

2. AHRI certification for the United States and Canada.

3. UL certification controller for recovery and external recirculation marks for the United States and Canada.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

C. ASHRAE/IES Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IES 90.1.

1. Comply with efficiency requirements in ASHRAE 189.1, which supersede requirements in ASHRAE/IESNA 90.1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

E. Energy Star Compliance: Fabricate and label equipment in compliance with Energy Star requirements.

1. Special Requirements: NSF 5 construction.

F. High Altitude: approved up to 10,200 ft or (3,109 m).

G. SCAQMD Rule 1146.2 Type 1 Compliance: Provide units with low nitrous oxide emissions that meet or exceed 14 ng/j or 20 ppm NOx requirements at 3%.

2.03 SYSTEM REQUIREMENTS

A. General: Provide tankless condensing water heater with microprocessor control and a direct electronic ignition system (with no standing pilot), fully modulating gas control valve, turbine flow meter, automatic electro-mechanical water flow control valve, and water temperature thermistors to maintain outlet water temperature between ± 2°F of set point temperature. Microprocessor shall have built in recirculation logic to control a pump's heating cycles.

B. Controls: Provide an integrated temperature thermostat with an adjustable set point range of 96°F to 185°F.

C. Error Memory: Provide water heater with no less than nine diagnostic maintenance codes that can be read via the display on the temperature thermostat controller.

D. Emissions: Provide water heater that produces no more than 20 ppm NOx emissions when tested in accordance with the rules and regulations of the South Coast Air Quality Management District.

E. Burners: Provide tankless water heater with downward fired fiber mesh burners, solid brass water flow control valve, and solid brass inlet and outlet water connections.

F. Junction Box: Provide pre-installed electrical junction box.

G. Heat Exchanger Construction: 400 series stainless steel.

2.04 INDOOR TANKLESS GAS WATER HEATERS.

A. General: ANSI Z21.10.3/CSA 4.3 for gas-fired, hybrid, domestic-water heaters for indoor application.

1. Basis of Design Product: Navien NPE, Model 240A2.

2. Uniform Energy Factor: 0.95.

3. Temperature Setting Range: 97 to 185 degrees F (36 to 85 degrees C).

4. Fuel: Natural Gas

    a. Gas Consumption: 13,300 to 199,900 Btu/hr.

    b. Gas Supply Pressure:

        1) Natural Gas: 3.5 to 10.5 inches of water column.

        2) Propane: 8.0 to 13.5 inches of water column.

5. Electrical: Provide 120 V/60 Hz AC power source, with consumption as follows:

    a. Normal Usage: 52 Watts.

    b. Max Current: 4 Amps.

6. Hot Water Flow Rate Capacity: 11.2 GPM at 35°F temperature rise.

7. Pressure Rating: 150 psi

8. Heat Exchanger: Dual, stainless steel heat exchangers.

9. Freeze Protection: For ambient temperatures as low as –5°F.

10. Recirculation Pump: Internal recirculation pump to provide a zero GPM activation rate.

11. Buffer Tank: Provide Internal insulated 0.5-gallon buffer tank to eliminate the introduction of cold water into the hot water supply line on occasions of frequent on/off operations.

2.05 TANKLESS RACK SYSTEMS

A. Tankless Free-Standing Rack System – Base Kit.

1. Capacity: Single unit, front mounted or Two unit, mounted Back to back.

2. Rack Frame: 1.5 inch square tube 14 gauge hot rolled steel.

B. Tankless Free-Standing Rack System – Add-on Kit.

1. Capacity: Additional single unit mounted in-line or Two units, mounted Back to back, per Add-on Kit.

2. Rack Frame: 1.5 inch square tube 14 gauge hot rolled steel.

2.06 ACCESSORIES

A. Venting System: Exhaust manifold shall be a minimum of 3”, of either polypropylene or schedule 40 PVC/CPVC with horizontal or vertical termination.

1. Provide common vent system allowing up to twelve (12) units to vent through 6” vent diameter in the same system.

2. Provide system capable of configuring vent intake and exhaust in different pressure planes.

B. Exhaust damper: provide common vent system with dampers that allows venting without check valves.

C. Provide locked storage case mounted to rack system keyed per PISD's requirements. Storage case to include all necessary items for regular flushing maintenance procedure, and size for all components.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin work until adjacent substrates have been properly prepared to receive work specified in this section.

B. Verify that locations of concealed reinforcements have been clearly marked for the installer.

C. Locate reinforcement points and clearly mark their locations if not already done.

3.02 PREPARATION

A. Clean surfaces prior to installation.

B. Protect all adjacent surfaces from possible damage during installation of units.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Coordinate with plumbing piping, fuel piping, and related electrical work to achieve operating system.

B. Install in accordance with manufacturer’s current installation instructions, industry recognized best practices, and all code bodies having jurisdiction; do not install damaged products.

C. Test for proper operation and adjust until satisfactory results are obtained, including start-up and check out procedures as recommended by the manufacturer.

D. Protect adjacent finishes from damage during installation using manufacturer’s recommendations.

3.04 CLEANING AND PROTECTION

A. Clean and remove all grime or other soils using manufacturer’s recommended methods.

B. Damaged products must be repaired or replaced prior to substantial completion.

C. Protect installed products until completion of work specified in this section.

END OF SECTION 22 34 13

SECTION 22 42 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide all fixtures, drains, equipment, accessories and specialties indicated on the Contract Drawings, as specified, and as required under Section General Plumbing.

B. All fixtures and equipment shall be constructed of materials that are non-hazardous to the user. No lead or lead solder may be used where in contact with potable water, or asbestos for any purpose.

C. Faucets, shower heads, shower valves and similar items shall have chrome plated brass handles, spouts, plates and trim.

D. Include all necessary accessories and trim pieces such as escutcheons, traps, supply tubing, stop and basin cocks, etc. All brass piping shall be seamless brass tubing. Fittings shall be heavy cast brass. Nipples shall be extra heavy. All exposed pipe shall be chrome plated.

E. All flush valves shall have screwdriver angle stops with cap covers, vacuum breakers and be chrome plated. P-traps shall be cast brass body, adjustable type with bottom cleanout plug and 17 gauge tubing outlet with wall flange, chrome plated where exposed to view. Provide Marvel mechanical coupling for connection to copper piping. Provide 1/2" x 3/8" angle valve, loose key, supply stops with flexible supply risers for fixtures, chrome plated when exposed to view. Provide four stop keys.

F. Handicap fixtures shall have handicap compatible trim including stops and supplies, drains and valves. Provide Truebro Handi Lav-Guard vandal proof insulation kit over p-trap supplies and all sharp edges. Controls for flush valves shall be mounted on the wide side of toilet areas as required by the handicap codes.

G. All flush valves and self-closing faucets shall be adjusted for proper operation. Faucets shall have an “on” time of 4 to 5 seconds.

H. Hot water shall be piped to left hand side of plumbing fixture as user faces fixture.

I. Fixtures and equipment shall be delivered to the building properly crated and in perfect condition.

J. Install Bradley ASSE 1070 certified point of use mixing valve on HW supply side of all lavatories and sinks where fixture not already protected by a ASSE 1070 certified mixing valve, including fixtures not provided by Plumbing Contractor (i.e. lab sinks, kitchen faucets, etc.). Refer to Plumbing Drawings. Mixing valve by Bradley, Symmons, Leonard and Powers are acceptable.

1.03 ACCEPTABLE MANUFACTURERS

A. WATER CLOSETS, LAVATORIES AND URINALS: American Standard or Toto – certified by manufacturer for 1000 lbs static load (no mixing of manufacturers – all vitreous china fixtures shall be from same manufacturer).

B. SINKS AND SERVICE SINKS: Elkay or Moen.

C. MULTI-LAVS AND WASHFOUNTAINS: Bradley only.

D. MOP BASINS: Mustee #63M Only.

E. DRINKING FOUNTAINS: Elkay, Halsey-Taylor or Oasis.

1. (NO ELECTRONIC SOLENOID VALVE FOR BUBBLER OPERATION).

F. TOILET SEATS: Bemis 1655-C/SSSSCT with stainless steel, self-sustaining check hinge or equal by Beneke or Church. Black.

G. MANUAL FAUCETS: Chicago only.

1. For metering faucets, Chicago model 857-E12V665PSHAB only.

2. For non-metering faucets, Chicago model 802-V317XKABCP only.

H. MANUAL FLUSH VALVES: Sloan Royal only.

I. FIXTURE STOPS, P-TRAPS AND RISERS: McGuire or T&S Brass.

J. FIXTURE CARRIERS: J.R. Smith, Wade or Zurn (same manufacturer as drains and cleanouts).

K. INDIVIDUAL SHOWER VALVES: Bradley HD Only.

PART 2 - MATERIALS AND METHODS

2.01 FIXTURE SUPPORTS

A. GENERAL:

1. Provide fixture supports for all water closets, lavatories, urinals, drinking fountains and other wall hung fixtures.

2. All foot supports on all types of fixture supports shall be the type that does not extend out from under the wall on which the fixture is mounted.

3. Construction and installation of the supports shall be as required to suit the job conditions, the space available, and the riser diagrams and details on the Drawings.

B. CARRIERS:

1. WATER CLOSET CARRIER: Adjustable, horizontal or vertical closet carrier as required by waste piping. Provide hanger-rod support feet for carriers that span wide chases. Provide flush valve supply support with all water closet carriers. Carriers shall be bariatric type and designed for 1000-pound load.

2. LAVATORY CARRIER: Floor mounted steel uprights with concealed arms.

3. URINAL CARRIER: Floor mounted steel uprights with hanger and bearing plate. Provide flush valve supply support with all urinal carriers.

4. ELECTRIC DRINKING FOUNTAIN AND BUBBLER CARRIERS: Floor mounted steel uprights with hanger and bearing plate.

5. SERVICE SINK: Floor mounted steel uprights with hanger and bearing plate.

6. SCULLERY SINKS: Floor mounted steel uprights with hanger and bearing plate. Provide at each end of fixture where sink width requires it.

7. MULTI-LAVS AND WASH FOUNTAINS: Floor mounted steel uprights with hanger and bearing plate. Provide at each end of fixture where sink width requires it.

2.02 FIXTURES

A. See Drawings.

END OF SECTION 22 42 00

SECTION 23 00 00
GENERAL HVAC

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 INTENT OF DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications are intended to be complimentary. Any work exhibited in either of them whether in the other or not, is to be executed according to true intent and meaning thereof, the same as if set forth in all. Should any work required by the drawings and specifications be in violation of any Federal, State, County or City laws, ordinance or regulation, those laws and regulations shall prevail, and shall be complied with by the Contractor as a part of this work with no extra compensation.

B. The drawings are schematic in nature but show the various components of the system approximately to scale and indicate how they are to be integrated with other parts of the building. Determine exact locations by close coordination with the Owner's Representative, job measurements, determining the requirements of other trades and reviewing all contract documents. The Drawings indicated general routing of the various parts of the systems, but do not indicated all fittings, offsets and runouts which are required. The Contract includes these items as required to fit the system into spaces allotted for them.

C. Equipment that is scheduled is the basis of the design, and have been coordinated for space, installation and electrical requirements. Space, installation and electrical requirements for other equipment and models from acceptable manufacturers have not been verified or coordinated. Contractor shall verify these requirements prior to using other equipment in his bid and include any additional costs for installation of the equipment. This includes general construction and MEP costs.

1.03 PERMITS AND FEES

A. The contractor shall obtain and pay for all permits and licenses, file all notices, pay all legal fees and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work specified or shown on the drawings. This applies to Federal, State and Local Codes and Requirements. Approval to the various insuring and inspection authorities shall also be obtained. Refer to Architectural sections for additional information.

1.04 GUARANTEE

A. All materials, apparatus and equipment furnished and installed under this Section of these Specifications shall be new and free from any defects when accepted by the Owner and shall be guaranteed in writing for a period of one year from the date of acceptance by the Owner unless noted to have extended warranties.

1.05 COOPERATION

A. The Contractor shall cooperate with other trades on the job and make installations in the proper sequence during the construction of the buildings, and he shall notify the Architect well in advance of construction of all interference of his work with that of other trades and of building construction. This notification shall not relieve the contractor of his responsibilities.

1.06 VISITING THE SITE

A. The Contractor shall be familiar with the Drawings and Specifications and shall have examined the premises and understand the conditions under which he will be obligated to operate in performing the contract. No allowance shall be made consequently for any error through negligence in this regard.

1.07 WORKMANSHIP

A. All work shall be performed in a neat workmanlike manner and in the best practice of the trade. Only workmen skilled in the trades shall be employed to perform the work included in these specifications.

1.08 MATERIALS

A. Materials, when not otherwise definitely specified, shall conform to applicable National Specifications and Standards. All materials shall be certified to not contain any asbestos or other material banned by the Environmental Protection Agency. Lead shall not be used in any material, pipe or solder in contact with the domestic water system.

B. The names of manufacturers and model numbers have been used in the Contract Documents to establish type of equipment and standard of quality. Where only one name is mentioned for a particular item of material, then that manufacturer is the only one acceptable. Where several names are mentioned, any one of those listed may be furnished provided submittal contains sufficient information to show complete compliance with contract Documents. No attempt has been made to determine if each manufacturer listed will produce material that will comply with all requirements of this project or will fit the allotted space; if they do, then it will be acceptable.

C. Requests for substitution during the bidding period, in accordance with the requirements of the Special Conditions, must be accompanied by a complete product submittal with all features, accessories and capacities noted. Large equipment must include a 1/4" scale drawing showing how the equipment and required access space are compatible with the available space. Acceptance for bidding does not waive the post bidding requirement for formal submittal and approval.

1.09 REMOVAL OF RUBBISH AND CLEAN-UP

A. Keep area of operations free from accumulation of waste material or rubbish at all times. At the completion of the work, remove all rubbish, tools, scaffolding and surplus materials from the area

of operations. The exposed parts of the Mechanical installation which are to be painted shall be thoroughly cleaned of cement, plaster, grease, oil spots and other materials in preparation for painting. All piping shall be cleaned of cement, plaster and other construction debris prior to being concealed above accessible ceilings or being insulated. Clean exposed piping prior to final inspection. All construction areas shall be left "broom" clean on a daily basis. Prior to final acceptance, vacuum clean all mechanical rooms including equipment.

1.10 OPERATION TESTS AND ADJUSTMENTS

A. After completion of the work and before final acceptance thereof, the Contractor shall notify the Architect when he is ready for the balancing of air and hydronic systems which will be performed by a professional test and balance firm selected by the Owner as described in Section 23 05 93.

1.11 LUBRICATION

A. After the installation is completed, lubricate all moving parts of all equipment furnished under this Division of the Specifications requiring same. Leave with the Owner a brief but complete set of lubrication instructions, showing the recommended frequency of lubrication and the type of lubricant recommended for each piece of equipment.

1.12 NOISE AND VIBRATIONS

A. The Contractor shall guarantee that the entire system and its component items of equipment, as installed by him, shall operate without objectionable vibration or noises, as determined by the Architect. If, in the opinion of the Architect, objectionable vibration or transmission thereof to the building occurs, the Contractor shall execute such remedial measures as are necessary to eliminate such unsatisfactory operating conditions and the material and labor thereby required shall be performed at the Contractor's expense.

1.13 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. ELECTRICAL: Power wiring is specified in the Electrical Section. Interlock and control wiring (any voltage) is specified under this Section. Controllers, starters and VFD’s for mechanical equipment are to be provided under Mechanical Section, Division 23.

B. PAINTING OF EQUIPMENT, PIPING AND ACCESSORIES: Painting Section. However, all items furnished under this Section shall be kept clean and free from corrosion.

C. OPENINGS: Various Sections. However, the locations of all inserts and openings shall be determined under this Section and coordinated with other Sections in ample time to avoid cutting new construction.

D. CUTTING, PATCHING AND FURRING: Various Sections. However, the locations of all inserts and openings shall be determined and coordinated with other sections.

E. EQUIPMENT AND PIPING SUPPORTS: Refer to structural drawings, details and notes for specific support and pipe hanging requirements. Specific loading and attachment methods shall be followed to assure that individual structural members are not overloaded.

1.14 GENERAL EQUIPMENT REQUIREMENTS

A. Manufacturer's printed directions shall be followed for preparing, assembling, installing, erecting and cleaning manufactured materials or equipment, unless otherwise directed.

1.15 SHOP DRAWINGS

A. Submit seven complete sets of shop drawings checked and certified by the contractor as being checked and lists of materials furnished under this Division. Shop drawings shall be approved before installation of the material under consideration.

B. Shop Drawings shall consist of published ratings of capacity data, detailed construction drawings, wiring and control diagrams, performance curves, installation instructions, manufacturer's installation drawings and other pertinent data. Where equipment and material has related to meeting the building CHIPS (Collaborative for High Performance Schools) Requirements, submittal shall indicated compliance with the respective CHIPS criteria. Where the literature is submitted covering a group or series of similar items, the item under consideration shall be clearly indicated. Ductwork shop drawings shall include one blueline set and one reproducible set. Drawings shall be submitted showing revisions to equipment layouts due to use of alternate or substitute equipment. The front sheet of each copy of the submittal shall have the following typed information:

1. Job name and location.

2. General Contractor's name, address, Project Manager's name and telephone number.

3. Submitting Sub-contractor's name, address, Project Manager's name and telephone number.

4. Suppliers company name, address, salesman's name and telephone number.

5. Signature of an officer or attorney-in-fact of the Sub-contractor with date and title and a statement that the submittal materials and equipment complies with the Contract Documents.

6. Any submittal without all of the above information will be rejected without review.

C. Equipment that has regional representation shall only be supplied by the regional representative that serves the area where the project is located. The regional representative’s name and signature shall be included with the shop drawing.

D. Shop Drawings are required for but are not limited to the following items:

E. Approval of these submittals shall not be construed as releasing the contractor from compliance with the contract Documents. They are a means of coordinating the work and aiding in the proper selection and installation of equipment. Do not release items such as fire dampers and starters until associated equipment or ductwork drawings are approved. All materials and equipment shall be subject to final acceptance by the Engineer at the completion of construction and adjustments of the system.

F. If a submittal is returned to the Contractor marked “Rejected” or “Revise and Resubmit”, only one (1) additional submittal will be permitted without the Contractor incurring charges for the additional re-submittals. Lee Truong & Yu Engineers (LTY) shall be reimbursed by the Contractor for any expense in connection with any necessary submission in addition to the two (2) submissions allowed. Contractor will be billed by LTY at a rate of $125/hr for these occurrences.

1.16 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to jobsite until progress of construction has reached the stage where equipment is actually needed, or until building is closed in enough to protect equipment from the weather. Equipment allowed to stand in weather will be rejected, and Contractor is obligated to furnish new equipment at no cost to Owner.

B. Adequately protect equipment (including all Owner-furnished items) from damage after delivery to job. Cover with heavy cloth as required to protect from damage.

C. Equipment which has been damaged by construction activities will be rejected. Contractor shall furnish new equipment at no cost to Owner.

1.17 CUTTING AND PATCHING

A. Coordinate the work with other trades to arrange for all holes, chases, and other spaces necessary for the installation of all components of the mechanical systems. Inform the other trades in ample time for these to be provided. Failure to comply with this requirement may necessitate cutting and patching work. If such work becomes necessary, it will be done under this Section of the specifications, and shall conform to all applicable requirements of other Sections of the Specifications.

1.18 STRUCTURAL STEEL

A. All structural steel used for the purpose of fabricating pipe supports, pipe guides, pipe anchors, equipment supports, and framing for large ducts and plenums, shall conform to ASTM Designation A-36. All steel used for these purposes shall be new, clean, straight and galvanized.

1.19 CONCRETE PADS

A. All equipment mounted on the floor, including expansion tanks and pot feeder, shall have a concrete house keeping pad. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge. Nominal thickness shall be 4” except air handling units and indoor chillers shall be 6”. Refer to details for outdoor equipment.

1.20 SPARE PARTS LISTS, OPERATING INSTRUCTIONS

A. At completion of job, furnish three copies of spare parts lists and operating instructions for all equipment furnished under this Division. These lists and instructions shall be published by the manufacturer of the equipment and shall be in good condition. Bind in 3-ring binder with project

name.

1.21 TOOLS AND SPARE PARTS

A. Upon completion of the installation, deliver to the Owner all tools and spare parts that are furnished by the Equipment Manufacturer for use with the equipment furnished under this Contract.

1.22 REFRIGERANT AND OIL

A. Furnish and install full refrigerant and oil charge in the air conditioning refrigeration systems and maintain it for full term of the guarantee.

1.23 RECORD DRAWINGS

A. Obtain a set of project drawings and keep these at jobsite during construction. During the course of construction, mark on these prints any changes which are made, noting particularly locations for those items which will need to be located for servicing. At completion of job, mark each sheet "Record Drawings", date and deliver to Architect.

1.24 OWNER'S INSTRUCTIONS

A. Provide the following periods of instruction to the Owner's designated personnel upon completion of the system's installation. Provide additional training as noted in individual equipment specifications.

1.25 ALTERNATES

A. Determine the scope of each specified alternate proposal by carefully reading all Divisions of the Documents. The Bid Form contains information explaining the extent of the construction to be performed under a specific alternate. Alternate proposals, which are not predominantly mechanical in scope, are described in other Divisions of these Documents. Pay particular note to re-roofing items that may necessitate adjustments to existing piping.

B. Alternative Equipment: Certain types of equipment as listed below require the specified brand and model to be included in the base bid. At the contractor’s option, he may propose equivalent equipment from one of the listed alternate manufacturers for one or more of these types of equipment. The contractor shall list in this alternate bid the name of the item, manufacturer’s name, model number and the amount to be deducted from his base bid.

1.26 MEP INSPECTIONS

A. Contractor shall formally request inspections from LTY to review any and all MEP installations. Inspections shall include but not be limited to: pipe tests, underground installations prior to backfill, rough-in installations, wall cover inspections, above ceiling inspections, final inspection.

B. Information required from Contractor on each and every request for inspection is as follows:

1. Specific type of test (i.e. hydrostatic test, head pressure test, medium pressure duct test, etc.).

2. Exact location of test (i.e. area of building with wing or room numbers).

3. Description of test (i.e. partial inspection, walls only, chase walls, wall cover, ceiling cover, etc.)

4. Exact time test started (required test time per Project Manual will need to have elapsed prior to LTY inspection). Estimated time test will start will not be acceptable.

5. Pressure reading on gauge at time of request for all pipe tests (provide picture of gauge with request).

6. Verification from General Contractor with name of person that verified, that specific test has been verified by the Contractor and all sub-contractors to meet all requirements of the Specifications and Codes (prior to inspection request).

C. Contractor shall provide a MINIMUM of 48-hour notice prior to requested inspection time, no exceptions.

D. INSPECTION REPORTS: After each inspection, LTY will generate an inspection report and distribute promptly. The Contractor will then be given 7 working days from date of report to address all deficiencies listed on the report. The GENERAL CONTRACTOR shall verify that all items on each inspection report have been addressed by their subcontractors in this time period. Once verified the GENERAL CONTRACTOR shall sign-off on each deficiency listed on the report and return the signed-off copy of the inspection report to LTY via e-mail. After the signed-off report is returned to LTY, the GENERAL CONTRACTOR shall request a re-inspection by LTY to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, LTY reserves the right to re-inspect whenever our schedule allows, with these re-inspections still being subject to Paragraph E below.

E. TEST REJECTIONS AND RE-INSPECTIONS: If a test is rejected or a re-inspection of an issued LTY Inspection Report is found to NOT be completely addressed, only ONE (1) additional inspection will be permitted without the Contractor incurring charges for each additional inspection required. LTY shall be reimbursed $500 by the GENERAL CONTRACTOR for expenses in connection with EACH inspection in addition to the two (2) inspections allowed.

1.27 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.

1.28 SUBSTANTIAL COMPLETION

A. No portion of the total contract will be declared substantially complete until the automatic temperature controls for that portion has been demonstrated to be complete and functioning as intended. The temperature control system will be complete and functioning as intended when all of the space temperatures are maintained at plus or minus two degrees of set point.

B. Contractor shall inspect, clean, service and/or replace if damaged air filters and strainers. Contractor shall notify architect, engineer and district to observe work.

1.29 DEMOLITION AND REMODELING

A. In areas of demolition, contractor shall remove all HVAC equipment, ductwork, piping and devices not to be reused. Any material that has salvage value shall be offered to the Owner, and if accepted, delivered to his warehouse. If not accepted it shall be properly disposed of with the other construction debris.

B. Where existing systems serve other areas as well, they shall remain active in those areas. Cap, patch and relocate ducts, piping, etc to keep systems operable.

C. Remove and replace ceilings, walls, floors and other finishes as necessary to install or modify mechanical systems.

D. Where ceilings are to be removed or replaced, remove and reinstall diffusers, grilles or other existing mechanical devices.

E. Relocate ductwork and piping as necessary to allow new or modified construction. Repair existing mechanical systems damaged by construction activities.

F. Where existing starters are to be reused, install heaters with proper size for revised loads.

G. Where large equipment is to be replaced (chillers, boilers, air handling units, etc.), ensure that equipment that is an acceptable manufacturer but not the scheduled brand will fit the available space and can be installed through existing doors, louvers or windows, prior to using this equipment in the bid.

H. Where new chilled or heating water piping connects to the existing system, system may require partial or complete draining of water. Include the costs of shutdown, drainage, refilling with properly treated water, and restarting of the system. Prior to performing the tie-ins, the contractor shall contact NALCO to have the existing water systems tested and documented. If the chemical content of the water systems do not meet the District’s standard, NALCO shall be responsible for treating the water systems prior to the contractor performing works.

I. Where existing equipment is modified or replaced and interfaces with the Energy Management System, disconnect and reconnect EMS wiring, and replace end devices and sensors as necessary.

J. Where existing building opening does not accommodate removal of the whole unit to demolished, equipment shall be disassembled or cut into sizes capable of being removed without modification

to existing building component.

1.30 CONSTRUCTION PHASING FOR RENOVATION AND ADDITION PROJECT

A. Phasing of construction shall be the sole responsibility of the General Contractor. Construction phasing shall accommodate all needs and schedules required by the Owner, including any temporary cooling, heating, dehumidification for critical spaces. All costs for construction shall be included in the price submitted by the Contractor on the bid date. No additional money will be approved for the Contractor or their sub-contractors to accommodate costs (including labor) associated with construction phasing.

END OF SECTION 23 00 00

SECTION 23 00 05
HVAC OPERATING AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.01 HVAC OPERATION AND MAINTENANCE MANUAL

A. 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.

(a) Shop drawings, coordination drawings and product data as specified.

B. 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.

END OF SECTION 23 00 05

SECTION 23 01 00
COORDINATION DRAWINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

PART 2 – REQUIREMENTS

2.01 COORDINATION DRAWINGS

A. The Mechanical Contractor shall take the lead in coordinating the Mechanical (HVAC), Electrical, Plumbing and Fire Protection Systems within the building.

B. The Mechanical Contractor shall coordinate a three-dimensional (3-D) model of the building which includes the Mechanical (HVAC), Electrical, Plumbing and Fire Protection Systems. The Electrical, Plumbing and Fire Protection Contractors shall prepare their work and generate 3-D models which will be given to the Mechanical Contractor for coordination. The Contractor will be provided with the REVIT model and CAD files that were used to generate the contract documents. These files may be used as the background file. The Contractor shall replace the systems drawn with the actual shop drawing models. The Contractor is not limited to using REVIT, but may use any 3-D software in generating and combining the coordination model. If an alternate software is used, all contractors must agree to provide compatible software models.

C. Submitting the contract drawings as coordination drawings will not be acceptable.

D. The model shall include detailed and accurate representations of all equipment to be installed based upon the reviewed equipment submittals.

E. The Mechanical Contractor shall hold a 3-D coordination meeting with all sub-contractors present to review the model and discuss coordination of the installation of the building systems.

F. Upon completion of the coordination meeting, the Contractor shall submit the 3-D model and 1/4” scale drawings for review.

G. The model shall detail major elements, components and systems in relationship with other systems, installations and building components. Indicate locations where space is limited for installation and access, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of pipe, duct, equipment and other materials. Include the following:

a. Wall and type locations

b. Clearances for installing and maintaining insulation.

c. Locations of light fixtures and sprinkler heads.

d. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.

e. Equipment connections and support details.

f. Exterior wall and foundation penetrations.

g. Routing of storm and sanitary sewer piping.

h. Fire-rated wall and floor penetrations

i. Sizes and locations of required concrete pads and bases.

j. Valve stem movement.

k. Structural floor, wall and roof opening sizes and details.

2. Indicate scheduling, sequencing, movement and positioning of large equipment in the building during construction.

3. Prepare floor plans, elevations and details to indicated penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air distribution devices, light fixtures, communication systems components and other ceiling mounted items.

H. Sequence of Coordination

Below is hierarchy of model elements and the sequencing by which the models will be coordinated:

1. Structural and Architectural Model

2. Miscellaneous steel

3. Perform preliminary space allocation

4. Identify hard constraints (locations of access panels, lights, A/V space requirments, etc.

5. Main and medium presure ducts from the shaft out

6. Main graded plumbing lines and vents

7. Sprinkler mains and branches

8. Cold and hot water mains and branches

9. Lighting fixtures and plumbing branches

10. Smaller sized ducts and flex ducts

11. Smaller size cold water and hot water pipig, flex ducts, etc.

I. The Contractor and Sub-Contractors shall not install any item until the coordination has been completed and reviewed by the Construction Manager, Owner and A/E Team.

J. This Contractor shall be responsible for coordination of all items that will affect the installation of the work of this Division. This coordination shall include but not be limited to: ampacity, capacity, electrical and piping connections, space requirements, system construction, building requirements and special conditions.

K. By submitting shop drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

END OF SECTION 23 01 00

SECTION 23 05 13
HVAC MOTORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

1.02 THE GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL, SUPPLEMENTARY AND SPECIAL CONDITIONS, APPLY TO THE WORK SPECIFIED IN THIS SECTION.

PART 2 – MATERIALS AND METHODS

2.01 MOTORS

A. GENERAL: This section applies to all motors. Select for starting torque and current, suitable to start and continuously run equipment served. Horsepower rating shown on Drawings are preferred, but motor must not be loaded more than 1.0 X nameplate horsepower. Provide larger motor if required to stay within this limitation and include all costs for any required increases in the electrical system. All motors shall have metallic nameplates marked with information required by NEC 430-7. Motors that are controlled by inverters shall designed for this application and provided with integral shaft grounding ring.

B. ENCLOSURE: Totally enclosed fan cooled for (TEFC) all 3 phase AHU, pumps, towers, and outside air supply fan motors. Otherwise, open drip proof (ODP) motors are acceptable. Frame construction shall be steel or cast iron with all surfaces including air passages coated with a rust inhibiting primer and finished with an alkyd or epoxy enamel paint.

C. INSULATION: Class B for maximum 40° C ambient, Class F or H or higher.

D. EFFICIENCY: Motors shall be premium efficiency type and have all copper windings.

1800 RPM ODP motor				1800 RPM TEFC motor			
1	HP	-	85.5%	1	HP	-	77.0%
1.5	HP	-	86.5%	1.5	HP	-	84.0%
2	HP	-	86.5%	2	HP	-	85.5%
3	HP	-	89.5%	3	HP	-	85.5%
5	HP	-	89.5%	5	HP	-	88.5%
7.5	HP	-	91.0%	7.5	HP	-	89.5%
10	HP	-	91.7%	10	HP	-	90.2%
15	HP	-	93.0%	15	HP	-	91.0%
20	HP	-	93.0%	20	HP	-	91.0%
25	HP	-	93.6%	25	HP	-	91.7%
30	HP	-	94.1%	30	HP	-	91.7%
40	HP	-	94.1%	40	HP	-	92.4%
50	HP	-	94.5%	50	HP	-	93.0%

E. SERVICE FACTOR: 1.15.

F. ELECTRICAL CHARACTERISTICS: Provide nameplate ratings the same as circuit voltage indicated on the electrical drawings. Coordinate to give proper operation with starting equipment scheduled.

G. SINGLE PHASE MOTORS: Permanent split capacitor start unless special load requires another type, resilient mounting, inherent overload protection and sealed bearings requiring no lubrication but with provisions for future lubrication.

H. THREE PHASE MOTORS: Ball bearings with grease lubrication fitting on top and drain on side or bottom. Average bearing life shall be 150,000 hours.

I. INSTALLATION: All motors 10 HP and greater shall be provided with Tyco Gelcap motor connector kit or other listed insulated multi-tap connection. Otherwise, provide copper alloy split bolt connector with rubber and electrical tape. Wire nuts are not acceptable.

J. ACCEPTABLE MANUFACTURERS: Allis Chalmers, AO Smith, Baldor, Century, General Electric, Marathon, Reliance, Siemens, US Motors Weg and Westinghouse.

END OF SECTION 23 05 13

SECTION 23 05 48
VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide the miscellaneous HVAC and Plumbing Equipment materials and services as shown on the Drawings and specified herein.

PART 2 – MATERIALS

2.01 VIBRATION ISOLATION

A. GENERAL: All vibration isolation devices shall be designed and furnished by a single manufacturer, or supplier, who will be responsible for adequate coordination of all phases of this work. Submittal data shall show type, size and deflection of each isolator proposed.

B. CORROSION PROTECTION:

1. All vibration isolators shall be designed or treated for resistance to corrosion.

2. Steel components shall be PVC coated, or phosphated and painted with industrial grade enamel. All nuts, bolts and washers shall be zinc electroplated. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc chromate or metal etching primer. A finish coat of industrial enamel shall be applied over the primer.

C. SELECTION: Spring deflections listed are static deflection and are minimum requirements. Isolation efficiencies listed are minimum. The springs shall be capable of 30% over-travel before becoming solid (minimum 1/2" clearance at final inspection). All isolators supporting a given piece of equipment shall be selected for approximately equal deflection.

D. FIRST TWO PIPE HANGERS FROM EACH PIECE OF EQUIPMENT ISOLATED ON SPRINGS: Provide a spring hanger consisting of a rectangular steel box, coil spring, spring cups, neoprene impregnated fabric washer and steel washer. The hanger box shall be capable of supporting a load of 200% of rated load without noticeable deformation or failure. Static deflection shall be equal to isolation units supporting equipment to which piping is connected.

E. FIRST TWO PIPE HANGERS FROM EACH PIECE OF EQUIPMENT ON ISOLATORS OTHER THAN SPRINGS: Provide an elastomeric hanger, consisting of a rectangular steel box and an elastomeric isolation element, which shall be of Neoprene or high-quality synthetic rubber with anti-ozone additive. The elements shall be designed for approximately 1/4" deflection and loaded so that deflection does not exceed 15% of the free height of the element. The design shall be such as to prevent metal-to-metal contact between the hanger rod and the steel box.

F. AIR HANDLING UNITS: Units are internally isolated from the factory.

G. PUMPS: Mount pumps on CPF inertia base consisting of steel pouring frame with reinforcing bars welded in place and inboard isolator attachments with Amber/Booth Type RSW-1 spring isolators, 1" deflection.

H. FLEXIBLE HOSE: Flexible connections at pumps shall be stainless steel flexible hose with flanges and stainless-steel wire braid. Furnish 5-year warranty for leak-free performance. Amber Booth Type SS-FP.

I. FANS:

1. GENERAL: This Section refers to in-line fans and other structure hung fans including CVT (VAV)fan powered BOXESboxes (CVT/CVB/FPB).

2. FANS LARGER THAN .5 HORSEPOWER: Provide a spring hanger consisting of a rectangular steel box, coil spring, spring cups, neoprene impregnated fabric washer and steel washer. The hanger box shall be capable of supporting a load of 200% of rated load without noticeable deformation or failure. Size for 1½" deflection, 95% efficiency.

3. SMALL HORSEPOWER, STRUCTURE MOUNTED FANS INCLUDING CVT BOXES: Provide an elastomeric hanger, consisting of a rectangular steel box and an elastomeric isolation element, which shall be of Neoprene or high quality synthetic rubber with anti-ozone additive. The elements shall be designed for approximately 1/4" deflection and loaded so that deflection does not exceed 15% of the free height of the element. The design shall be such as to prevent metal-to-metal contact between the hanger rod and the steel box.

J. ACCEPTABLE MANUFACTURERS: Amber/Booth, Kinetics, Mason, Vibro Acoustics and Triplex.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

END OF SECTION 23 05 48

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 – MATERIALS AND METHODS

2.01 EQUIPMENT MARKING

A. GENERAL: Each piece of mechanical equipment shall be suitably marked with the name as listed on the plans. Name shall be prominently displayed so it may be easily located and read after equipment installation. Pumps may be marked on adjacent piping.

B. Provide 1/16” thick engraved plastic labels for equipment with white background and black letters/numbers. Length and width may vary based on label content, but 1” x 3” is the minimum size. Secure labels with adhesive and screws.

C. The following equipment to received labels:

1. CH’s
2. BR’s
3. AHU's
4. ACCU’s
5. Fans
6. FPB/VAV
7. Mini Splits
8. FCU

D. Install factory made arrow marker on new piping in Mechanical Rooms.

2.02 PIPE MARKING

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

B. Apply markers as follows:

1. At input and output of each piece of equipment inside building.

2. At each valve not in a mechanical room.

3. At every point a pipe enters or exits a wall or floor.

4. At intervals not exceeding 20 feet.

C. These markers shall conform to OSHA and ANSI A 13.1 Codes. Arrow markers must have same ANSI background colors as their companion pipe markers and wrap completely around pipe with 3” overlap.

D. Pipe markers and arrow markers shall be provided as follows:

1. Chilled Water Supply

2. Chilled Water Return

3. Heating Water Supply

4. Heating Water Return

5. Refrigerant Suction

6. Refrigerant Liquid

7. Condensate Drain

E. All piping in mechanical or air handling unit rooms (or insulation if insulated) shall be painted in accordance with the Owner's color code prior to installing pipe markers.

2.03 VALVE MARKING

A. Each valve, except those located adjacent to the equipment they serve, shall have a tag of .0.50 inch thick by 1½" diameter brass, stamped or engraved with the valve number and service symbol. Attach tag to the valve handle with double loop of 18 gauge, type 302 stainless steel wire, with a minimum of four wraps to secure. Chain of similar gauge and material may be used.

B. On the "As Built" Drawings, mark the symbol and number of all valves, exactly as the valves are tagged.

C. Furnish a valve schedule properly identifying the valve number and service with the exact location, the material within the pipe and the room numbers or area that the valve serves.

D. Provide one valve schedule, as above, installed in aluminum frame with lexan shield, and mount on wall of main equipment room.

E. At valves above accessible ceilings, glue red star on ceiling tee intersection nearest the valve location.

2.04 PAINTING

A. GENERAL: All piping or insulation on piping exposed to view shall be painted. Insulated pipe with required metal jacket shall not be painted.

B. PAINT TYPE: Industrial grade, high gloss enamel over suitable primer. Provide two finish coats.

C. COLOR CODING: (Verify with Architect prior to painting)

1.	Condenser Water (inside only)	Beige
2.	Chilled Water	Dark Blue
3.	Heating Water	Maroon

END OF SECTION 23 05 53

SECTION 23 05 93
HVAC TESTING AND BALANCING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Do all work required for preparation for HVAC Systems Testing and Balancing to be accomplished by others.

B. Provide all instruments and equipment required to accomplish necessary testing and adjusting, and as required by the Architect to verify performance. All instruments shall be in accurate calibration and shall be calibrated in ranges that will be expected.

1.03 DESIGN CONDITIONS

A. The air conditioning systems have been designed and the equipment selected to perform as follows:

Summer Conditions		
Indoor Temperatures	72° F DB	55% RH
Outdoor Temperatures	98° F DB	80° F WB
Winter Conditions		
Indoor Temperatures	68° F DB	
Outdoor Temperatures	27° F DB	

PART 2 – METHODS

2.01 GENERAL

A. The HVAC contractor shall clean and adjust all systems as described in paragraph 2.2.

B. The testing, adjusting, and balancing (TAB) of the air conditioning systems and related ancillary equipment for the Owner will be performed by an impartial, technical TAB firm selected and employed by the Owner as described in paragraph 2.04.

2.02 HVAC

A. BOILER INSTALLATION

1. GENERAL: Before initial firing, obtain inspection approval from the inspection authority and the manufacturer's representative, that the installation is safe for firing.

2. OPERATIONAL TEST: Check operation and proper sequencing of all operating and safety controls and devices. Check pressure relief valve for opening at proper pressure. Make Orsat flue gas analysis and adjust firing for proper air-gas mixture.

3. BOILER LICENSE: Contractor shall go on line to http://www.license.state.tx.us/boilers/blrforms.htm and provide completed boiler installation report and temporary boiler operating permit forms.

B. HVAC CONTRACTOR'S SCOPE OF WORK

1. As a part of this contract, the HVAC Contractor shall make any changes in the sheaves, belts, dampers, valves, pump impellers, etc. required for correct balance as required by the TAB firm, at no additional cost to the Owner.

2. The HVAC Contractor shall provide and coordinate services of qualified, responsible subcontractors, suppliers and personnel as required to correct, repair or replace any and all deficient items or conditions found during the testing, adjusting and balancing period.

3. In order that all systems may be properly tested, balanced and adjusted as required by these Specifications, the contractor shall operate the systems at his expense for the length of time necessary to properly verify their completion including final adjustments, balancing and readiness for Owner's TAB firm. This length of time shall be acceptable to the Inspector. Contractor shall provide all devices to verify correctness of operation.

4. Contract completion schedules shall provide sufficient time to permit the completion of TAB firm's services prior to Owner occupancy.

5. The Drawings and Specifications have indicated valves, dampers and miscellaneous adjusting devices for the purpose of adjustment to obtain optimum operating conditions, and it shall be the responsibility of the contractor to install these devices in a manner that will leave them adjusted, accessible and readily adjustable. Should any such device not be readily accessible, the contractor shall provide access as requested by the TAB firm. Any malfunction encountered by TAB personnel and reported to the contractor or to the inspector shall be corrected by the contractor immediately so the balancing work can proceed.

6. The scope of the TAB work as defined herein is indicated in order that the contractor will be appraised of the coordination, adjustment and system modification which will be required under the project work in order to complete the Owner's requirements for final TAB. The TAB firm will not have a contractual relationship with this contractor but will be responsible to the Inspector and Owner for the satisfactory execution of the TAB work. The contractor shall allow sufficient funds in the project cost estimate and bid proposal to provide all work which may be required in the TAB phases as defined herein and as may be necessary for the completion of the TAB work as defined by the TAB firm.

C. RELATED WORK

1. The contractor shall have the building and air conditioning systems in complete operational readiness and shall perform all other items as described herein to assist the TAB company in performing the balancing, testing and adjusting of the HVAC systems.

2. For the air distribution systems, the contractor shall complete and verify the following:

    a. Verify installation for conformity to design. All supply, return and exhaust ducts terminated.

    b. All volume, splitter, extractor and fire dampers properly located and functional. Dampers shall provide tight closure and full opening, smooth and free operation.

    c. All supply, return, exhaust, transfer grilles, registers, diffusers and terminal units installed, leak tested and operational.

    d. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be blanked and/or sealed to eliminate excessive by-bass or leakage of air.

    e. All fans (supply, return, relief and exhaust) operating and verified for freedom from vibration, proper fan rotation and belt tension; overload heater elements to be of proper size and rating; and clean filters installed.

3. For the water circulation systems, the contractor shall complete the following:

    a. Check and verify pump alignment and rotation.

    b. Water systems shall be cleaned by circulation and strainers cleaned for normal operation.

    c. Check each motor amperage and voltage to ensure readings do not exceed nameplate rating.

    d. Verify electrical overload heater elements to be of proper size and ratings.

    e. All water circulating systems shall be full and free of air; all vents installed at high points of systems.

    f. Check and set operating temperatures of heat exchangers to design requirements.

4. For the automatic controls system, the contractor shall complete the following:

    a. Verify that all control components are installed in accordance with project requirements, a point-to-point check of all DDC and computer controls has been completed and that all controls are functional, including all electrical interlocks, damper sequence, air and water resets, fire and freezestats.

    b. All controlling instruments calibrated and set for design conditions.

5. The contractor and the suppliers of the equipment installed shall all cooperate with the TAB firm to provide all necessary data on the design and proper application of the system components and shall furnish all labor and material required to eliminate any deficiencies or mal-performance. Furnish a list of all motors with nameplate data and size of overload heater installed with motor amperage during operation.

6. During the balancing the temperature regulation shall be adjusted for proper relationship between controlling instruments and calibrated by the Control Manufacturer using data submitted by the TAB firm. The correctness of the final setting shall be proved by taking hourly readings for a period of three successive eight-hour days, in a typical room on each separately controlled zone. The total variation shall not exceed 2□ F from the preset medium temperature during the entire temperature survey period.

7. In all fan systems, the air quantities shown on the plans may be varied as required to secure a maximum temperature variation of 2□ F within each separately controlled space, but the total air quantity indicated for each zone must be obtained. It shall be the obligation of the contractor to furnish or revise fan drives and/or motors if necessary, without additional cost to the Owner, to attain the specified air volumes.

8. The contractor shall assist the TAB firm in performing three inspections approximately 30 days apart within 90 days after occupancy of the building to ensure that satisfactory conditions are being maintained throughout and to correct any unusual condition.

9. The contractor shall assist the TAB firm in performing inspections in the building during the opposite season from that in which the initial adjustments required to produce optimum operation of the system components, to produce the proper conditions in each conditioned space.

D. STORAGE : The contractor shall provide the TAB firm a secure area of ample size, conveniently located for storage of tools, equipment and other items as required.

E. NOTIFICATION

1. Systems shall be complete and in operational readiness prior to notifying the Owner that the project is ready for the services of the TAB firm and the contractor shall so certify in writing to the Owner that such a condition exists.

2. Should the Owner be so notified and the TAB work commence and the systems are found to not be in readiness or a dispute occurs as to the readiness of the systems, the contractor shall request an inspection be made by the Owner. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for TAB services. Should the inspection reveal the notification to have been premature, all costs of the inspection and work previously accomplished by the TAB firm shall be paid for by the contractor. Furthermore, such items as are not ready for TAB services shall again be re-tested. Complete, operational readiness, prior to commencement of TAB services, shall include the work described in RELATED WORK above.

2.03 HVAC TESTING, ADJUSTING AND BALANCING

A. The testing, adjusting and balancing of the air conditioning systems will be performed by an impartial technical firm whose operations are limited only to the field of professional TAB. The TAB work shall be done under the direct supervision of a qualified engineer employed by the TAB company. Work shall be in accordance with procedures and techniques as outlined in the ASHRAE Systems Handbook in Chapter 57 on TAB and procedural standards for TAB, National Environmental Balancing Bureau.

B. The TAB firm shall be responsible for inspecting, adjusting, balancing and tabulating the data on the performance of fans, all dampers in the duct systems, all air distribution devices and the flow of water through all coils. The Mechanical Subcontractor, the various subcontractors involved and the suppliers of the equipment installed shall all cooperate with the TAB firm to provide all necessary data on the design and proper application of the system components and shall furnish all labor and material required to eliminate any deficiencies or mal-performance.

C. The TAB firm shall be responsible for conducting and overseeing the building flush out requirements as outlined in the project specifications and Plans.

D. Professional firms desiring to submit proposals for the performance of professional services for testing and balancing of HVAC systems for projects shall submit the necessary brochures, history of the firm, qualifications of personnel and other pertinent information to Cypress Fairbanks ISDthe Owner.

E. Professional firms submitting such information on its qualifications and personnel shall keep the information current by submittal of supplemental data a minimum of once every six months or when professional or technical personnel who shall perform the work may change. The Owner shall review the qualified professional firms, with current qualifications submitted, which may be available to perform this work and request proposals, from time to time, for new projects.

F. Each professional firm warrants by the submittal of its personnel qualifications, that such personnel shall be used in the performance of the work. In the event of personnel change, the professional firm submitting a proposal shall submit the complete qualifications and experience record of new personnel. The Owner, upon acceptance of the proposal, expects the work to be performed by the personnel whose experience is so described.

G. QUALIFICATIONS OF THE FIRM

1. The firm shall be one which is licensed to do professional services of this specified type in the State of Texas and as a minimum, have one professional engineer licensed in the State of Texas, with current registration, to perform such professional services.

2. The firm shall have a minimum of one-year operation under its current firm name.

3. The firm shall be capable of performing the services specified at the location of the facility described within the time specified, preparing and submitting the detailed report of the actual field work performed and following up the basic work as may be required.

H. DOCUMENTS

1. The Owner will provide plans, specifications and change orders to the TAB firm.

2. The Owner will provide approved submittal data on equipment installed.

3. The Owner will transmit one copy of the following “Records for Owner” to the TAB firm for review and comment:

a. “As-Installed” Drawings

b. Approved Fixture Brochures, Wiring Diagrams and Control Diagrams

c. Shop Drawings

d. Instructions

e. Valve Charts

I. RESPONSIBILITY OF THE TAB FIRM

1. The TAB personnel shall check, adjust and balance the components of the air conditioning system which will result in optimum noise, temperature and air flow conditions in the conditioned spaces of the building while the equipment for the system is operating economically. This is intended to be accomplished after the system components are installed and operating as provided for in the contract documents, which is the responsibility of the project contractor.

2. The tests shall demonstrate the specified capacities and operation of all equipment and materials comprising the systems. Such tests shall be made as are deemed necessary by the Architect to indicate the fulfillment of the contract. The TAB firm shall then make available to the Engineer such instruments and technicians as are required for spot checks of the systems.

3. The TAB firm will not instruct or direct the contractor in any of the work. Any proposed changes or revisions in the work shall be submitted to the Architect in writing. The Architect will process the proposal as appropriate.

J. BALANCING SERVICES

1. The TAB firm, Architect and Owner will inspect the installation of heating and cooling pipe systems, sheet metal work, temperature controls and other component parts of the heating, air conditioning and ventilating systems. The inspection of the work will cover that part relating to proper arrangement and adequate provisions for the testing and balancing. The inspections shall be performed periodically as the work progresses.

2. Upon formal notification of completion of the installation and start-up of the mechanical equipment by the contractor, TAB firm will balance, test and adjust the system components to obtain optimum condition in each conditioned space in the building.

3. The TAB firm shall be responsible for inspecting, balancing, adjusting, testing and compiling the data on the performance of fans, all dampers in the duct systems, all air distribution devices or heat exchangers, and the water flow through all coils.

4. The TAB firm will, fourteen days prior to Final Inspection, as requested by the Owner prepare seven copies of the completed Test and Balance Report. The report shall be complete with logs, data and records as required herein and all logs, data and records shall be typed, produced on white bond paper and spiral bound. The report shall be certified accurate and complete by a principal engineer of the TAB firm. Transmit one copy directly to the Owner’s Representative and the remaining six copies to the Architect. The Architect will review and approve the report. Upon approval, two copies will be submitted to the Owner’s Representative and two copies transmitted to the Contractor.

K. REPORT: After balancing is complete and before calling for final observation, record and submit for record, the following data:

1. For each chilling unit:

    a. Water temperature entering and leaving cooler.

    b. Water pressure entering and leaving cooler.

    c. Water temperature entering and leaving condenser (air temperatures for air cooled unit).

    d. Water pressure entering and leaving condenser with flow points marked.

    e. Pressure drop - flow curves for cooler and condenser with flow points marked.

    f. Motor nameplate F.L.A., actual amps and voltage.

    g. Compressor suction and discharge pressures.

2. For each pump:

    a. Suction and discharge pressure readings at shut off.

    b. Suction and discharge pressure readings at final balance flow.

    c. Motor nameplate F.L.A., actual amps at rated flow, voltage and verify rotation.

    d. Copy of pump curve, with final balance point marked.

3. Each new air handling unit:

    a. Total supply, return and outside air CFM.

    b. Suction and discharge static pressure, total static pressure.

    c. Fan RPM measured by tachometer. Verify rotation.

    d. Motor nameplate F.L.A., actual amps and voltage.

    e. Entering and leaving air temperature for each coil at full water flow.

    f. Entering and leaving water temperature for each water coil at full flow.

    g. Coil water pressure drop with point marked on flow curve at full flow.

    h. CFM of each outlet served by unit.

4. Each new VAV or FPB box:

    a. Total supply CFM in full cooling.

    b. CFM of each outlet served by unit when in full cooling.

    c. Entering and leaving air temperature for heating coil at full water flow.

d. Entering and leaving water temperature for heating coil at full water flow.

5. For each modified or new supply and exhaust fan:

a. Suction and discharge static pressure, total static pressure and total CFM.

b. Fan RPM measured by tachometer. Verify rotation.

c. Motor nameplate F.L.A., actual amps and voltage.

d. CFM of each outlet served by fan.

6. Each boiler:

a. Safety inspection authority approval certificate.

b. Orsat flue gas analysis report.

c. Operating pressure and temperature.

d. Safety control setting points.

7. Each CCU & FCU:

a. Total supply CFM in full cooling.

b. CFM of each outlet served by ducted unit.

c. Entering and leaving air temperature.

8. Each data value that cannot be balanced to meet scheduled design value:

a. List the cause of the discrepancy between the actual data and the design value.

b. List corrective action that must be taken to meet design value.

c. Note that “Not Operating” is not an acceptable entry into the Testing and Balancing report. If a piece of equipment is not operating during the testing and balancing process, TAB firm will contact Mechanical Contractor. Mechanical Contractor will repair system as required. TAB firm will then test and balance the system as specified.

L. REPORT APPROVAL: After report is submitted and reviewed by Engineer, Test and Balance Contractor shall meet Engineer at the site to review balancing problems and perform a random check of data values listed in report. Contractor shall bring all necessary testing and balancing equipment to site necessary to measure values.

M. AFTER OWNER OCCUPANCY:

1. After Owner has occupied and is using the building, make three additional inspections of the system during the one-year warranty period (at times directed by Owner) to:

a. Correct any Owner observed temperature imbalances.

b. Check correct operation of equipment and verify by letter to the Architect for each trip. List in the letter corrections made.

2. At the season opposite that of start up, inspect and verify correct operation of all systems. Make adjustments as required.

END OF SECTION 23 05 93

SECTION 23 07 13
HVAC INSULATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Install all insulation in conformance with manufacturer's recommendations and these specifications.

B. All interior adhesives and sealants must meet VOC limit requirements of South Coast Air Quality Management District (SCAQMD) Rule #1168.

C. All interior paints and coatings must meet VOC limit requirements of South Coast Air Quality Management District (SCAQMD) Rule #1113 and Green Seal GS-11 and GS-03.

D. Insulation materials manufactured by the following list of companies will be acceptable provided their materials conform to these specifications (see Paragraph on Substitution): Armstrong, CertainTeed, Childers, Foster, Knauf, Insulphen, Manville, Owens-Corning, Pittsburg-Corning and Polyguard.

E. Flame Spread and Smoke Requirements:

1. All jackets, adhesives, coatings, insulating materials and vapor barrier mastics for air distribution systems shall meet the requirements of NFPA Bulletin 90-A with a flame spread of 25 or less and smoke developed rating not higher than 50.

2. All jackets, adhesives, coatings, insulating materials and vapor barrier mastics for piping and equipment shall have a flame spread not higher than 25 and smoke developed rating not higher than 50.

3. All materials containers shall have a U. L. Label.

F. At each pipe support point, install a hard section of phenolic foam pipe insulation, minimum 18" length, on lower 180° of piping, 360° if clamps are used on top of pipe, same thickness as adjacent insulation, to prevent compression at support bearing area. Seal and finish to match adjoining insulation. Provide formed 16 gage galvanized sheetmetal saddles, same length as hard section, to completely cover hard section. Saddles shall be strapped / banded at each end so that do not move or slide.

G. Install .020" thick aluminum jacket with minimum 2” overlap joint on all insulated piping exposed outside building. Install factory made aluminum covers on all elbows. Cut aluminum neatly to fit all tees, such that all insulation is covered by aluminum. Use waterproofing aluminum colored Foster 95-44 or Childers CP-76-1 sealer to seal all joints with 1/8” bead. Provide .020x3/4” aluminum bands not more than 12" on center for all jacketing. Install aluminum covers on

insulated pipe inside that is exposed to view in finished areas. Cover is not required in mechanical or AHU rooms. Jacketing in contact with soil shall be .010" stainless steel. Allowed manufacturers are: ITW Lock-on (Childers) and ITW Z-Lock (Pabco).

H. Insulate all piping 360 degrees around pipe and do not include hangers in the insulation of the pipe.

PART 2 – MATERIALS AND METHODS

2.01 CHILLED WATER PIPING

A. GENERAL:

1. Insulate all chilled water piping, valves, fittings, air separators, tanks, filter feeders and other items subject to condensation. Insulate chiller connections to chiller barrel insulation so there is no break in the insulation of the system.

2. At all pipe hangers insulate with rigid foam 360 degrees around pipe and do not include hangers in the insulation of the pipe.

3. Install protective made of galvanized steel with ½-inch aluminum band clamps at each end

B. PIPE:

1. MATERIALS: Molded phenolic foam pipe insulation, 3.7 pounds per cubic foot density, conductivity (k) not higher than .14 at 100° mean temperature difference with factory attached fire retardant, vapor barrier jacket. Insulation inside building above ceilings or 7 feet above floor in mechanical rooms may be 2.2 pound per cubic foot density.

2. EXECUTION: Install insulation over pipe and carefully connect self sealing laps. Provide 3" butt strips at each joint between sections, sealed with Foster 85-75 or Childers CP-82 adhesive. Coat all vapor retarder film (ASJ) longitudinal and butt joints with Foster 30-80AF anti fungal, vapor barrier coating to prevent moisture ingress. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Apply Foster 95-50 or Childers CP-76 insulation joint sealant on all phenolic insulation longitudinal and butt joints to prevent moisture ingress.

C. VALVES, FITTINGS AND OTHER COMPONENTS:

1. MATERIALS: Pre-molded cover of same materials and thickness as pipe covering.

2. EXECUTION: Provide vapor barrier coating consisting of a tack coat of white Foster 30-80AF anti-fungal, vapor barrier coating with reinforcing mesh, finished with a 1/16" thick coating of Foster 30-80AF vapor barrier coating. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. This application shall provide a minimum dry film thickness of 37 mils.

D. KOOLPHEN INSULATION THICKNESS:

1. 1 1/2” thick insulation for: 1/2” through 2” pipe

2. 2” thick insulation for: 2 ½” through larger pipe

E. Manufacturers

1. Koolphen - Phenolic Foam

2. Dow

3. Tarec Ecophen - Phenolic Foam

2.02 BUILDING HEATING WATER PIPING

A. Insulate all hot water piping with factory molded pipe covering made from glass fibers; 2" thick (1½” thick for pipes 1½” and smaller) with density not less than 3 pounds per cubic foot; conductivity (k) not higher than .25 at 100° mean temperature difference; with factory attached fire retardant jacket. Piping insulation outside shall be 1/2“ thicker.

B. Secure all laps and joints with staples at 4" on center. Provide 3" butt strips at each joint between sections.

C. Insulate fittings with pre-molded cover of same materials and thickness as pipe covering.

D. Acceptable manufacturers: Johns-Manville Micro-Lok AP-T, Owens-Corning ASJ/SSL, and Knauf ASJ/SSL.

E. Manufacturers:

1. Johns-Manville Micro-Lok AP-T

2. Owens-Corning ASJ/SSL

3. Knauf ASJ/SSL

2.03 CONDENSATE DRAINS

A. Insulate all condensate drain lines with 3/4" thick, closed cell foam insulation with a thermal conductivity (C value) of .27 at 75° F. Insulation shall have a maximum flame spread rating of 25 and a maximum smoke density rating of 50. Exposed piping located close to the floor inside an equipment room, from an air handling unit to floor drain within 24”, need not be insulated.

2.04 CHILLED WATER PUMP

A. GENERAL: Insulate all cold surfaces as required to prevent condensation. Do not insulate pump until the chilled water system has been balanced.

B. MATERIALS: 2" thick phenolic or close cell insulation.

C. INSTALLATION: Cut and form to fit or foam in place. Fill any voids with closed-cell insulation. Seal all joints with Foster 30-80. Apply tack coat white Foster 30-80 and then a 1/16" thick finish

coat of same material.

D. Acceptable manufacturers: Koolphen - Phenolic Foam, Dow or Tarec Ecophen - Phenolic Foam.

2.05 CHILLED WATER SYSTEM EXPANSION AND STORAGE TANKS, AIR SEPARATOR AND FILTER FEEDER

A. Insulate with 2" thick closed cell foam insulation covering conforming to Specifications for Refrigerant Piping Insulation.

B. Acceptable manufacturers: Koolphen - Phenolic Foam, Dow or Tarec Ecophen - Phenolic Foam.

2.06 LAP AND JOINT ATTACHMENT

A. Self-sealing type jackets will be acceptable provided the laps are sealed per the manufacturers recommendations and the installation is 100% visually inspected by the insulation contractor's foreman.

2.07 REFRIGERANT PIPING

A. GENERAL: Insulate all refrigerant piping.

B. MATERIAL: 1.5" thick, EPDM closed cell foam insulation with a thermal conductivity (C value) of .27 at 75° F. Insulation shall have a maximum flame spread rating of 25 and a maximum smoke density rating of 50. Chemical composition of material shall not cause or accelerate corrosion or other deterioration of piping.

C. INSTALLATION: Install insulation in accordance with the manufacturer's recommendations using pre-glued slits and butt joints. Visually inspect joints and touchup as necessary with the manufacturer's recommended adhesive. Insulation without pre-glued factory slits shall be installed over piping during fabrication then glued together. Provide aluminum jacketing over insulated piping.

D. MANUFACTURER: Armaflex, Rubatex or ImcoLock by IMCOA

2.08 DUCT INSULATION

A. GENERAL: Insulate all supply air ducts, return air ducts through un-insulated spaces and outside air ductwork, including kitchen hood supply air ducts and dryer vent. Insulate exhaust ducts down stream of inline fan backdraft damper. Insulate backs of all supply air devices.

B. DUCTS INSIDE: 2” thick, fiberglass flexible duct insulation, 1 pound density (Type 100), conductivity (k) value not more then 0.27 at 75° mean temperature difference with an installed R value of 6 or higher, with factory adhered reinforced foil faced flame resistant Kraft paper vapor barrier. Wrap around duct with minimum lap of 2 inches each way, staple with 1/2" outward clinch staples 2” on center, secure on bottom of duct with water based, fire retardant adhesive (Foster 85-60 or Childers CP-127). For ducts 24” to 30” wide, provide one row of pins on bottom of duct, 16” on center. For wider ducts provide one row on bottom of duct for each 16” of width. Trim pins flush with retainer disk. Seal all with tape with Foster 30-80AF vapor barrier coating. For ducts in

mechanical rooms, reduce spacing to 12” on center for each 12” of dimension (all sides of duct). Seal joints and seams with 3" wide FSK foil tape, including termination of flex ducts, and coat tape with Foster 30-80AF vapor barrier coating. Where insulation terminates at equipment (AHU, fan coil, VAV box, etc) and where insulation is custom fitted to transitions and elbows, add glass cloth strip adhered with anti fungal Foster 30-80AF vapor barrier coating between equipment and insulation cover. Coating permeance shall be 0.013 perms or less at 43 mil dry thickness as tested by ASTM E96 and meet ASTM D5590 with 0 growth rating.

C. DUCTS OUTSIDE: Insulate with 2.0" thick urethane insulation and cover with 3M VentureClad heavy duty insulation jacketing tape (1527GCW-WM).

D. Manufacturers:

1. Schuller 814 Spin-Glass FSK.

2. Owens-Corning Type 703 board RKF.

3. Knauf 3 PCF FSK.

2.09 KITCHEN HOOD EXHAUST DUCT

A. Insulate with two 2" layers of 2300° F rated wrap similar to Pyroscat FP Duct Wrap. The first layer shall be un-faced. The second layer shall have a foil facing on the outside surface. Secure each layer to duct with 16 gage stainless steel wires at 9" on center. Apply 1" x 1" poultry mesh over finish layer, wired in place with 16 gage stainless steel wire at 12" on center. Separately insulate cleanout access doors to allow removal for inspection and cleaning duct without damaging insulation. 3M Fire Barrier Duct Wrap installed per manufacturer’s recommendations is acceptable.

2.10 DUCT LINER

A. GENERAL: Liner shall only be installed where specifically noted on the drawings. Use is typically for return air ducts, return air elbows/boots and certain supply air ducts in quiet areas. Liner shall be installed per manufacturer’s recommendations.

B. MATERIAL: 1” thick, 1½ pound per cubic foot density, neoprene faced, "K" value not more than .27 at 75° F mean temperature difference. Material shall be or coated with anti-microbial agent and manufactured by one of the following companies:

1. CertainTeed Corporation’s ToughtGard R or R-EP with Enhanced Surface

2. Johns Manville’s Duct Liner PM or Linacoustic RC

3. Manson Insulation Products’ AKOUSTI-LINER R Rigid Duct Liner or Flexible Duct Liner

4. Owens Corning’s QuietR Textile Duct Liner

C. INSTALLATION: Adhere liner, with coated side toward air stream, to all interior sides of duct with 100% coverage of Foster 85-11. Further secure the liner with mechanical fasteners on maximum 12" centers. All edges and fasteners shall be coated with one brush coat of Foster 30-35.

D. PLENUMS: Plenum interiors exposed to view through louvers and grilles shall be lined and have pins painted flat black. Provide bullnose on all edges facing in coming air direction.

END OF SECTION 23 07 13

SECTION 23 08 00
HVAC SYSTEMS TECHNICAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. The purpose of this Section is to define responsibilities in the Commissioning Process. Additional system testing is required within individual Specification Sections.

B. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. General Commissioning requirements and coordination are detailed in Division 01. Division 20-25 Contractors shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Owner's CxA, shall execute all Commissioning responsibilities assigned to them in the Contract Documents and include the cost of Commissioning in the Contract price.

C. HVAC systems to be commissioned include the following (some may not apply – refer to the Plans and other sections of the specifications for the scope of work):

1. Chillers
2. Cooling
3. Boilers
4. Pumps
5. Air Handling Unit Systems
6. DX Split Systems
7. Air Terminal Units (10% Sampling
8. Fan Coil Units
9. Exhaust and Supply Fan Sytsems
10. Fire, Fire/Smoke and Volume Dampers (Review of testing documentation provided by the conractor)
11. HVAC / Building Automation System and Integrations
12. HVAC / Emergency Power Source Integrations
13. HVAC / Life Safety Systems Integrations

D. The TAB Contractor will perform control sequence verification on each terminal unit shall independently verify each sensor and point and document the results to be included in the Final TAB Report. The CxA will commission 10% of the terminal units once TAB is complete with the CSV and point verification of the terminal units.

1.03 DEFINITIONS

A. Refer to the General Commissioning Requirements for definitions.

1.04 SUBMITTALS

A. Contractor shall provide Owner and/or CxA with documentation required for Commissioning Work. At minimum, documentation shall include: Detailed Start-up procedures, full sequences of operation, Operating and Maintenance data, performance data, control drawings, and details of Owner-contracted tests.

1. Shop drawings and product submittal data related to systems or equipment to be commissioned.

B. Contractor shall submit to Owner and/or CxA installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians.

1. Where installation testing may be performed in a progressive manner (i.e., piping hydrostatic testing, ductwork pressure testing, etc.), the Contractor shall prepare and submit to the Owner, A/E team and CxA a testing plan that details how the progressive testing will be performed, documented and presented for approval prior to the start of any testing activities.

C. Contractor shall provide any additional documentation needed to complete the requirements of the Commissioning Process

1. Factory Performance Test Reports: Review and compile all factory performance data to assure that the data is complete prior to executing the FPTs.

2. Installation testing reports such as ductwork pressure testing, piping hydrostatic testing, piping chemical treatment and flushing, bolt flange torqueing, and any documentation associated with local code authority inspections or authorizations.

3. Completed equipment Start-up certification forms along with the manufacturer’s field or factory performance and Start-up test documentation.

4. Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials and installation shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Refer to the General Commissioning Requirements for other work products related to the Commissioning Process

C. Contractor is required to follow all applicable industry and site-specific safety practices, lockout / tagout requirements, specialized PPE requirements, and provide qualified, trained personnel to

execute Commissioning Process requirements.

2.02 TEST EQUIPMENT

A. Contractor shall provide all specialized tools, test equipment and instruments required to execute Start-up, checkout, and testing of equipment.

B. All specialized tools, test equipment, and instruments required to execute Start-up, checkout, and testing of equipment shall be of sufficient quality and accuracy to test and/or measure system performance within specified tolerances. A testing laboratory must have calibrated test equipment within the previous twelve (12) months. Calibration shall be NIST traceable. Contractor must calibrate test equipment and instruments according to manufacturer's recommended intervals and whenever the test equipment is dropped or damaged. Calibration tags must be affixed to the test equipment or certificates readily available.

PART 3 – EXECUTION

3.01 CONSTRUCTION PHASE

A. In each purchase order or subcontract that is written for changes in scope, include the appropriate requirements for submittal data, Commissioning documentation, testing assistance, Operating and Maintenance (O&M) data, and training, as a minimum.

B. Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Owner, CxA or Contractor to facilitate the Commissioning process.

C. Provide manufacturer's data sheets and shop drawing submittals of equipment.

D. Provide additional requested documentation to the Owner and/or CxA, prior to O&M manual submittals, for development of System Verification Checklists and Functional Performance Testing procedures.

1. Typically, this will include detailed manufacturer's installation and Start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, full factory testing reports, if any, and full warranty information.

2. In addition, the installation, Start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Contractor and/or CxA.

3. This information and data request may be made prior to normal submittals.

E. With input from the BAS vendor and A/E, clarify the operation and control of commissioned equipment in areas where the Specifications, BAS control drawings, or equipment documentation are not sufficient for writing detailed test procedures.

F. During the installation, Start-up and initial checkout process, execute and document related portions of the System Verification Checklists for all commissioned equipment according to the procedures indicated in the Commissioning Plan.

G. Factory Start-ups: Factory Start-ups are specified for certain equipment. Factory Start-ups generally are Start-up related activities that will be reviewed and checked prior to Functional Performance Tests. All costs associated with factory Start-ups shall be included with the contract price unless otherwise noted. Notify the Commissioning Team of the factory Start-up schedule and coordinate these factory Start-ups with witnessing parties. The Commissioning Team members may witness these Start-ups at their discretion.

H. Independent Testing Agencies: For systems that specify testing by an independent testing agency, the cost of the test shall be included in the Contract price unless otherwise noted. Testing performed by independent agencies may cover aspects required in the System Verification Checklists, Start-ups, and Functional Performance Tests. Coordinate with the independent testing agency so that CxA, Owner and/or A/E can witness the test to ensure that applicable aspects of the test meet requirements.

I. Incorporate manufacturer's Start-up procedures with System Verification Checklists (SVC).

J. Air and water test, adjust and balance shall be completed with discrepancies and problems remedied before Functional Performance Tests of the respective air or water related systems are executed.

K. Provide skilled technicians to execute starting of equipment and to assist in execution of Functional Performance Tests. Ensure that they are available and present during the agreed-upon schedules and for a sufficient duration to complete the necessary tests, adjustments, and problem solving.

L. Correct deficiencies (differences between specified and observed performance) as interpreted by the Owner's Project Manager and A/E and retest the system and equipment.

M. During construction, maintain as-built marked-up Drawings and Specifications of all Contract Documents and Contractor-generated coordination Drawings. Update after completion of Commissioning activities (include deferred tests).

N. Provide training of the Owner's operating personnel as specified.

O. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

3.02 WARRANTY PHASE

A. Execute seasonal or deferred tests, witnessed by the CxA and Owner, according to the Specifications.

B. Complete deferred tests as part of this Contract during the Warranty Period. Schedule this activity with the Owner.

C. Correct deficiencies and make necessary adjustments to O&M manuals, Commissioning documentation, and as-built drawings for applicable issues identified in any deferred or seasonal testing.

3.03 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 installation shall be in accordance with the Project Documents.

3.04 TRAINING

A. Refer to the individual section of this Specification for specific training requirements on each system.

B. Refer to the General Commissioning Requirements and Division 01 for overall training requirements related to the Commissioning process and this project.

END OF SECTION 23 08 00

SECTION 23 08 01
COMMISSIONING AGENT REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Refer to section 23 08 00 for commissioning requirements and Division 1 for additional information.

1.02 DESCRIPTION OF THE WORK

A. This Section covers the Scope of Work for the Commissioning Agent (CxA) who will be hired by the Owner.

B. The Commissioning Agent shall oversee the commissioning of the HVAC systems as described in Section 23 08 00. The CxA shall prepare pre-commissioning and functional performance test checklists to be used by the Contractor. Prepare and publish a commissioning plan. Witness startup and operational tests of equipment and systems. Perform observations of the mechanical systems throughout construction and prepare the final commissioning document.

C. The CxA shall have authority to direct and schedule test. The CxA shall have no authority to direct changes to the systems.

1.03 COMMISSIONING PLAN

A. The CxA shall prepare a plan listing the parties involved with their responsibility, scope, definitions, safety concerns, design criteria, attendance schedules, commissioning schedules, and commissioning manual requirements.

1.04 COMMISSIONING FORMS

A. Review 100% CD’s. Provide written summary of how each commissioned item of equipment, should operate include calculations verifying scheduled capacity.

B. The CxA shall develop forms similar to that in Section 23 08 00 for the Contractors use during the commissioning process. The forms shall become part of the final commissioning manual. Forms shall be provided for each piece of commissioned equipment and system. Any deviations from the design shall be noted and proved by the Owner prior to acceptance. Each form shall be signed by the Contractor, CxA and Owner prior to acceptance of a system or piece of equipment.

1.05 COMMISSIONED EQUIPMENT

A. All equipment as scheduled.

1.06 COMMISSIONED SYSTEMS

A. All new HVAC systems in the Building as shown on the Plans.

1.07 PROJECT OBSERVATIONS

A. The CxA shall perform observations of the commissioned equipment and systems twice a month at a minimum and more as required to keep pace with construction. The CxA shall note progress and any deviations of the construction documents shall be brought to attention of the Contractor and Owner for resolution. The CxA will have no authority to direct changes or corrections to the system. Observation reports shall be published to the Owner, Architect and Contractor and shall be part of the final commissioning manual.

1.08 OPERATIONAL AND START-UP TESTS

A. The CxA shall witness start-up tests and collect documentation of the tests. The CxA shall notify the Architect and Contractor of any deviations from the contract documents. Any deviations shall be corrected or accepted by the Owner prior to acceptance.

B. After the Contractor has submitted in writing that the systems are completed, the CxA shall schedule and direct operational tests of the systems. These tests shall be as described in Section 23 08 00 and 23 09 XX. The results shall be documented and made part of the commissioning manual. Any deviations from the design shall be brought to the attention of the Architect and Contractor. Any deviations shall be corrected or accepted by the Owner prior to acceptance.

1.09 COMMISSIONING MANUAL

A. The CxA shall prepare the final commissioning manual. The manual shall provide a complete history of the commissioning process and shall include:

1. Design and Energy Codes.
2. Commissioning Plan.
3. Completed Commissioning Forms.
4. Completed Observation Reports.
5. Completed Start-up Reports.
6. System Operational Tests.
7. Final sequence of operation to be achieved.
8. Summary of building operation as commissioned, noting deviations from design.
9. Design Criteria (extended from Design Documents by CxA).
10. Written summary of normal startup and operating procedures for each commissioned item of equipment.

B. The manual shall be a three-ring binder with tabs for each section. Provide 5 copies.

END OF SECTION 23 08 01

SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Qualified temperature control contractors:

1. Alternate No. 9 - BCMS - Unify

    a. Alternate No. 9A: Daikin/Unify

    b. Alternate No. 9B: Trane/Unify

    c. Alternate No. 9C: Carrier/Unify

2. Alternate No. 10 - BCMS - ALC

    a. Alternate No. 10A: Daikin/ALC

    b. Alternate No. 10B: Trane/ALC

    c. Alternate No. 10C: Carrier/ALC

B. The system shall be a Direct Digital Control System. All DDC Temperature Control Equipment shall be the product of approved manufacturers. All control valves shall be by Barber Colman, Belimo, Bray, Honeywell, Johnson, Robertshaw or Siemens.

C. The Electrical Contractor shall provide 120-volt power in each mechanical room to a single point. Control and interlock wiring, both low-voltage and 120 volts, shall be by the temperature controls Sub-contractor. Interlock wiring between fire alarm system shut down relays and mechanical system starters, VFD’s and temperature controls devices shall be provided by the Temperature Controls Contractor. All wiring shall be run in conduit except plenum rated, low voltage wiring above accessible ceilings may be installed without conduit if installed near structure. All temperature controls wiring shall follow the applicable sections of Division 16 including enclosing low voltage connections install panels or splice boxes. Controls contractor shall provide surge suppression (TVSS) protection for their equipment.

D. The temperature control Sub-contractor shall provide complete control wiring diagrams and interlock wiring diagrams which have been approved by the Architect and shall provide on-the-job supervision for the wiring installation. The temperature control system and its proper operation shall be guaranteed for a period of one year after substantial completion and any control devices which prove to be defective during the guarantee period shall be repaired or replaced without cost to the Owner. After the initial warranty period, an additional twelve-month preventative maintenance contract shall be included in the base price of this Contract. This maintenance

contract shall include quarterly preventive maintenance, all repair labor, parts and equipment. The system shall be warranted for parts and labor for a total of two years after date of substantial completion. All work shall be provided with a single warranty start date.

E. The temperature control contractor shall furnish six corrected copies of the final control wiring diagram and a letter stating that he has made final adjustments and instructed the Owner in the system operation at job completion.

F. Provide 8 hours of instructions on system operation to Owner's personnel prior to date of substantial completion. BAS provider shall also provide lifetime training of the facility's BAS at no additional cost of the Owner.

G. Technical support for 3 years over the phone shall be provided at no additional cost to the Owner. This support shall cover any graphic change after substantial completion date.

H. All setpoints, including time, temperature, humidity, pressure and flow, shall be adjustable.

I. System shall be capable of transmitting data over fiberoptic cable, being accessed through the internet and through the school's internal network system via standard web browsers.

J. Provide as-built drawings as a part of the online software for the building, that shows the exact location of all installed equipment.

PART 2 – MATERIALS AND METHODS

2.01 INSTALLATION

A. GENERAL

1. All automatic control valves shall be furnished by the controls manufacture.

2. The mechanical contractor shall receive, handle, mount and install all automatic temperature control valve bodies and linkages.

3. All control dampers furnished by the control manufacturer shall be installed by the sheetmetal contractor under the control manufacturer's supervision.

B. NAMETAGS: Install a plastic tape label identification tag on each item of control equipment, to correlate with the name shown on schematic drawing. Tag may be omitted for device which is obvious, such as a damper operator.

C. SENSOR LOCATIONS: Locations in finished spaces shall be reviewed with the Architect before beginning any installation work. Mount all wall sensors as noted on the floor plans at 46" above finished floor.

2.02 EQUIPMENT

A. TEMPERATURE SENSORS

1. GENERAL: All sensors shall be thermister type (10K at 77□F) with output over the scheduled temperature range.

2. ROOM SENSORS: Flush mounted within a wall box with aluminum cover. Sensing range shall be 45° to 96° F with an accuracy of □.25° F. Mount at +46".

3. OUTDOOR AIR SENSORS: Waterproof with sunshield over sensing element. Sensing range shall be -30° to 130° F with an accuracy of □1° F.

4. DUCT AIR SENSORS: Duct mounted junction box containing electronics and with 20 foot long averaging probe. Sensing range shall be 32° to 134° F with an accuracy of □1/2° F.

5. WATER SENSORS: Immersion type, screwed into threaded, pipe weld-o-let. Chilled water and condenser water sensing range shall be 20° to 120° F with an accuracy of □1/4° F. Heating water sensing range shall be 80° to 233° F with an accuracy of □3/4° F.

B. VALVE AND DAMPER OPERATORS: Belimo, Delta, Siemens or one of the listed valve manufacturers.

C. DAMPERS: Shall be of the opposed blade type with the frame constructed of 16 gage galvanized sheet steel formed into channels, riveted and corner brackets added to maintain perfect alignment of the damper. In the closed position, all edges of blades must stop against other blades or a fixed stop, in a manner to provide tight shut-off. Provide synthetic elastomer seals on all edges of damper blades. Blades shall consist of two formed sheets spot welded together for extra strength. Square pins shall be used along with oil impregnated sintered bronze bearings. Temperature range of the damper shall be -40° to 200° F. Leakage shall be less than 1/2% based on 2000 FPM approach velocity at 4" w.g. static. Submit certified test data for a typical damper, showing leakage characteristics. Test shall be performed by an independent testing laboratory.

D. TEMPERATURE CONTROL VALVES: Three-way or straight through globe valves as indicated. Valves 2" and smaller shall have screwed bronze bodies. Valves 2½" and larger shall have flanged iron bodies. Size all valves for full flow and with a maximum pressure drop of 5 PSI unless specified otherwise. All straight through water valves shall have equal percentage characterized plugs and be capable of shutting off against a minimum of 60 psi.

E. SMOKE DETECTORS: Detectors provided by the fire alarm subcontractor. Controls subcontractor shall wire the starter control circuit through the smoke detector auxiliary contact.

F. FREEZESTATS: Low temperature cutout thermostats shall have a 20-foot element with response to lowest temperature sensed by any 1 foot section.

G. ACTIVE FLOW DEVICES: Provide insertion type turbine or paddle wheel flow sensing device. Unit shall generate not more than 10 pulses per second at 10 FPS flow rate for input directly to the SCU. Calibrate device for flow rate based on pipe size. Overall accuracy shall be □3% of absolute flow. Install with ball type isolating valve for removal of sensor for servicing. Sensor shall be one of the followings:

1. Hydro-Flow Model 3100, Retractable Vortep Flow Meter by Fluidyne – Use this meter when velocity in pipe is adequate and there is enough straight pipe up and down stream.

2. Onicon F1210 Dual Turbine Flow Meter – Use this when installed in short pipe lengths.

H. VAV BOX CONTROLLER: Digital control package with integral damper operator for mounting in box controller housing.

I. Differential Pressure and Pressure Sensors. Sensors shall have a 4-20 MA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure, without damaging the device. Accuracy shall be within +2% of full scale. Sensors shall be manufactured by Trerice, Taylor, Marsh, Welksler, Marsholltown, Weiss or Miljoco.

J. High static limit switch: Switches shall be diaphragm operated with 3 ½" diaphragm to actuate a single pole double throw snap switch. Motion of the diaphragm shall be transmitted to the switch button by means of a direct mechanical linkage. It should include a 1.4 - 5.5" w.c. range pressure switch with manual reset snap switch. Dwyer 1900-5-MR.

K. Static pressure sensor: Provide a differential pressure transmitter with a 4-20 ma and 0-10VDC output to the BMCS. It shall operate on the capacitance principle and be capable of sensing very low positive, negative or differential pressures. In the capacitance cell, a lightweight diaphragm shall deflect a small amount when pressure is applied. This deflection creates a change in capacitance which is then detected and processed electronically. Modus T-30.

Accuracy:	+/- 1% of range
Ranges:	5.0"/12.5mbar
Operating temp range:	32°F to 125°F
Operating humidity range:	20% to 90% rh non-condensing

L. Water Differential Pressure Switches. Pressure switches shall have a repetitive accuracy of + 2% of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourbon tube design. Switch operation shall be adjustable over the operating pressure range. The switch shall have an application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy, or gold plating. Switches shall be Carrier HK06ZC033, Dwyer DYW-11-153-1, Square D 9012GGW4 or equivalent switch manufactured by Honeywell, Johnson Controls or MCC Powers. Install on all pumps if possible.

M. Air Flow Switches: Flow switches shall have a repetitive accuracy of □1% of their operating range. Switch actuation shall be adjustable over the operating flow range. Switches shall have snap-acting Form C contacts rated for the specific electrical application. Install per manufacturer's recommendations. Install delta P air flow switch on air handling units and fan coil units.

N. Current Sensing Relays. Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The setpoint of the contact operation shall be field adjustable. Install on fans, cooling tower and vertical turbine pumps.

O. Control Relays: Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts, enclosed in dust proof enclosure. Relays shall have silver cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices.

P. Solid State Relays (SSR): Input/output isolation shall be greater than 10 billion ohms with a breakdown voltage of 15V root mean square, or greater, at 60 Hz. The contact operating life shall be 10 million operations or greater. The ambient temperature range of SSRs shall be 20°F-140°F. Input impedance shall be greater than 500 ohms. Relays shall be rated for the application.

Operating and release time shall be 10 milliseconds or less. Transient suppression shall be provided as an integral part of the relays.

Q. Provide meters for all kitchen panels (480Y/277V, 208/120V and Emergency) to sense amps, KVA and KWH. Also, interface with for each electrical main switchboard to monitor phase voltage, phase amps, KW, KVA and power factor. Coordinate with electrical contractor as required for requirements. Meters provided by controls contractor, installed by electrical contractor.

R. WATER METER: Provide water meter with remote monitoring capability to allow the controls system to tabulate the water consumption of the building, and separate meter to control kitchen water usage. Meter to be a 6” Neptune TRU/FLO compound meter with Tricon/ES transmitter or equivalence. Transmitter for meter shall provide digital pulse output with 4-20mA option. Water meter to be full-line-size of water line installed on (i.e. 4" meter on 4" pipe), reference plumbing drawings for water pipe size. Meter to be provided by controls contractor, installed by plumbing contractor.

S. GAS METER: Provide gas meter with remote monitoring capability to allow the controls system to tabulate the gas consumption of the building. Meter to be a Romet Model RM-1100-ID Rotary gas meter (or equivalence) installed at the gas company gas meter output, ANSI 150 Flat-Faced flanged, IMAC Pulsimatic drive, 5-PSIG pressure compensated index mounted on IMAC transmitter, suitable for outdoor installation. Gas meter to be full-line-size of gas line installed on (i.e. 3" meter on 3" pipe), reference plumbing drawings for gas pipe size. Meter to be provided by controls contractor, installed by plumbing contractor.

T. Miscellaneous: Provide and install all relays, switches, and all other necessary devices required for a complete and satisfactory operating system.

2.03 LOCATIONS AND CONFIGURATIONS

A. Avoid whenever possible locating instruments outdoor and subject to freeze.

B. For differential pressure readings provide a single pressure gauge, header piping from each pipe and gauge cocks to alternate reading.

C. Provide Peterson Equipment Company test stations on the inlets and outlets of each hydronic equipment item and all bypass piping.

2.04 BUILDING AUTOMATION SYSTEM (BAS)

A. GENERAL CONDITIONS:

1. CONTRACTOR RESPONSIBILITY: The BAS Contractor shall be fully responsibility for the complete installation and proper operation of the Building Automation System equipment, sensors, controls, and controller. After the installation, the contractor shall be responsible for "debugging" and calibration of the BAS, including software for the duration of the warranty. All equipment shall be the latest standard design that complies with the specification requirements and is manufactured by Automated Logic Corporation. During the warranty period, Contractor shall monitor system from his office and provide

assistance to Owner. Should software control schemes provide unsatisfactory operation, as determined by the Engineer, during the warranty period, Contractor shall modify control schemes, setpoints, timing sequences or other software features to provide satisfactory operation as a part of his warranty package.

2. SYSTEM ARCHITECTURE: The system shall possess fully modular architecture that permits the expansion of the system through the addition of field modules, sensors and actuators. Module communications to be through a local area network (LAN). The central site system shall be used only as an interface to the LAN.

B. GRAPHIC CONSTRUCTION:

1. COLOR VALUE: Space temperature and its deviation from zone setpoint shall be displayed on a floor plan map by color. These colors shall represent a defined temperature value and be implemented by the same standard throughout the entire system, including all graphic displays and parameter pages. The central site shall be able to display graphically, in up to 64 different colors, the following system information:

a. General area maps shall show locations of controlled buildings in relation to local landmarks.

b. Floor plan maps shall show heating and cooling zones throughout the buildings in a range of colors which provide a visual display of temperature relative to their respective setpoints. The colors shall be updated automatically without operator action. Set point adjustment and color band displays shall be operator definable through the two-button mouse. Floor plan maps shall also show the relative position of sensors, exact location of mechanical rooms and AHU's, and all other mechanical equipment. Each zone shall display the setpoint temperature and measured temperature.

c. Mechanical system graphics shall show the type of mechanical system components servicing any zone through the use of pictorial representation of components. It shall also provide a current status of all I/O points being controlled and applicable to each piece of equipment including analog readouts in appropriate locations on the graphic representation of the setpoint and measured value.

d. All system graphics shall come programmed and require no owner modification. Individual graphics shall be as minimum the following:

1) Each air handling unit

2) Each zone of multi-zone

3) Each single or double duct mixing box

4) Each chiller

5) Complete chilled water piping system

6) Complete condenser water piping system

7) Complete hot water piping system

2. INFORMATION ACCESS: The following information shall be selectable from a "pop-up" menu available on various graphics:

Alarms	Schedule graphs
Message	Schedule groups
Module status	Setpoints
Programming parameters	Trends
Quit	Utilities
Schedules	AHU report
Temperature	EF/SF report

a. Programming, scheduling and setpoint changes shall be accessible for modification of each menu for the associated equipment. Operator shall be able to automatically download changes from the central site to the appropriate program for the equipment being controlled. Operator shall be able to upload information from the field modules to the central site. In addition to having the ability to adjust setpoints on zones individually, the system shall allow the operator to make global setpoint changes that would take one command and automatically download it to the individual pieces of equipment and adjust their setpoints up or down by the operator defined deviation. A global command shall be able to be input that will automatically affect all installations connected to the network.

C. SPECIFIC GRAPHIC REQUIREMENTS

1. Data Format

Temperature	Tenths	xx.x	ºF
Percentage	Units	xx	%
Amps	Units	xx	A
Humidity	Units	xx	%
Air Quantity	Units	xxxx	CFM
GPM	Units	xxx	GPM

2. Main School Screen

a. Provide an overview of the entire building with color coding of zones based on temperature relative to setpoint, with light gray indicating zone is off. Green shall be area within setpoint tolerance, and varying shades of light to darker blue for

lower than setpoint, and varying shades of light to dark red for higher than setpoint.

b. Clicking on an area of the building will change to a more detailed graphic of that area.

c. Provide table listing outside air temperature and RH percentage, and status for Fire Alarm, Emergency Generator and Air Conditioning Emergency Shutdown.

d. Provide button to click to go to equipment and mechanical systems graphics.

3. Detailed Area Graphics

a. Individual zones shall be color coded base on temperature relative to setpoint, with light gray indicating zone is off. Green shall be area within setpoint tolerance, and varying shades of light to darker blue for lower than setpoint, and varying shades of light to dark red for higher than setpoint.

b. Label zone by AHU, AHU and Zone or AHU and DD/VAV Box as applicable with zone temperature listed.

c. Clicking on zone cooling source or heating source shall transfer to applicable AHU or DD/VAV box.

d. Provide button for each AHU serving this area that transfers to the AHU graphic.

e. Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or ALARM. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

4. Main Equipment Graphic

a. Provide composite graphic for the chilled water/condenser water system at the central plant. The off/on condition of each chiller, pump and cooling tower shall be a color-coded element of the equipment: gray off, blue on, red failed. Additionally, equipment that is on shall have some graphical indication of its status by animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

b. Provide composite graphic for the heating water system at the central plant. The off/on condition of each boiler and pump shall be a color-coded element of the equipment: gray off, blue on, red failed.

c. Provide buttons for each AHU and RTU that will transfer to the associated graphic.

d. Provide buttons for chilled water, condenser water and heating water systems that transfer to the associated graphic.

5. Chilled Water System Graphic

a. Provide graphic that shows the chilled water system including pumps and chillers. Chilled water shall be light blue for water returning to the chiller and dark blue for water supplied by the chillers.

b. Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or ALARM. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

c. Each data point shall be displayed adjacent to a appropriate graphical symbol located in the proper position in the system. Include enable, status, alarm, run amps and % loaded for each chiller.

6. Heating Water System

a. Provide graphic that shows the heating water system including all pumps and boilers. Heating water shall be light red for return hot water and dark red for supply hot water.

b. Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or ALARM. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

c. Each data point shall be displayed adjacent to a appropriate graphical symbol located in the proper position in the system. Include enable, alarm and status of each piece of equipment.

7. Air Handling Unit Graphic

a. Provide graphic that shows all coils, valves and dampers. Outside air and return air shall be shown. For multizones, include graphic for each zone.

b. Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or ALARM. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

c. Each data point shall be displayed adjacent to a appropriate graphical symbol located in the proper position on the graphic. Include enable, alarm and status of each piece of equipment.

8. Air Terminal Box

a. Provide individual graphic for each box and equipment.

b. Provide graphic that shows all coils, valves and dampers.

c. Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or ALARM. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

d. Each data point shall be displayed adjacent to a appropriate graphical symbol located in the proper position on the graphic.

9. Fans and Unit Heaters

a. Equipment with local/room thermostat shall have graphic noting state of unit and associated space temperature.

b. Fans associated with a particular air handling unit shall be a part of the air handling unit graphic.

10. Main Mechanical Room

a. Provide graphic showing mechanical room fans, unit heaters and purge systems.

b. Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or ALARM. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Animations shall be observable but not distracting. Status shall be based on equipment status sensors, not condition of the enabling point.

c. Each data point shall be displayed adjacent to a appropriate graphical symbol located in the proper position in the system.

11. Utility Graphics: Provide screen graphics to display utility information (water, gas and electrical usage).

D. STAND-ALONE CONTROL UNIT (SCU):

1. DISTRIBUTED CONTROL: Each control unit shall be capable of full operation either as a completely independent unit or as a part of the building wide control system. All units shall contain the necessary equipment for direct interface to the sensors and actuators connected to it. Each control module shall be capable of stand-alone direct digital operation utilizing its own processor, memory, input/output, analog-to-digital conversion, clock (rechargeable battery backed for 30 days minimum) and voltage transient protection devices. No slave modules will be permitted.

2. MEMORY: The memory used in each module shall be non-volatile EEPROM type, which has read/write capability from the central site or local operator interface and does not lose its programs or operating data upon power failure. Power for each module shall be 24 VAC. Each module shall have an automatic restart feature with sequencing after power failure. Module memory shall not require reloading at power up.

3. COMMUNICATION: To share global building data, such as outside air temperature, humidity and electric demand, modules shall be able to communicate with each other at

156 Mhz over a local area network (LAN) of 75 ohm coaxial cable or single unshielded 18 gauge twisted pair wire. LAN shall be a standard RS485 Specification. Each module shall be capable of initiating calls to the central site over dial up phone lines using a Hayes compatible autodial/autoanswer modem. Each module shall be capable of communicating through LAN to the central site. Access to the LAN shall be available to the Owner at any point on the network through any module or by direct connection to the communication cable at any point. Communications between modules and communications between module networks and the operator's computer terminal shall utilize redundancy checking (CRC) to ensure proper and complete transfer of data. The system shall be capable of recognizing a failed module on the LAN and reporting the condition at the central site. If any module on the LAN fails or is powered down, it shall not inhibit the use of the LAN by other modules. System shall not rely on the school network system to operate.

E. SCU FUNCTION:

1. CONTROL FORMS: All temperature control functions shall be executed within the SCU. Loop control shall be executed via direct digital control algorithms. The user shall be able to customize control strategies and sequences of control, and shall be able to define appropriate control loop algorithms and choose any of the following control modes:

    Two-position (on-off, slow-fast, etc.)

    Proportional (P)

    Proportional plus integral (PI)

    Proportional, integral, plus derivative (PID)

    It shall be possible to fully create, modify or remove control algorithms within a specific unit while it is operating and performing other control functions. Input for these changes shall be made via the network form the central site computer or local operator interface. Each control loop shall be fully definable in terms of:

    Control Action

    Control Mode

    Gain

    Sampling Time

    Sensors/Actuators

2. ALARMS: Proof of equipment operating and alarm status shall be by positive feedback from the local control circuit as indicated on the Point List. The system shall have the capability of not only alarming abnormal OFF conditions of fans and pumps but shall also indicate abnormal ON condition of the same equipment. If a start command has not been issued from the central site and a piece of equipment is turned on, the central processor will alarm an abnormal ON. This abnormal ON shall also sound the audible alarm and display the alarm ON condition.

3. GLOBAL INFORMATION: The SCU's shall be able to share point information such that control sequences or control loops executed at one control unit may receive input signals from sensors connected to other SCU's within the network. If the network communication link fails or the other control units malfunction, the control loop shall continue to function using the last value received.

4. EMS FUNCTIONS: Each SCU shall be capable of performing the following energy management routines as a minimum:

Chilled or Heating Water Reset

Chiller Sequencing and Optimization, Lead/Lag

Duty Cycling (Temperature compensated)

Event Initiated Programs

Graphic Trend Analysis

Maintenance Management

Peak Demand Limiting

Source Optimization

Start/Stop Time Optimization

Supply Air Reset

Time of Day Scheduling

a. The building operator shall be able to manually restore all system programs from the central site hard disk.

2.05 SEQUENCE OF OPERATION

A. Refer to Section 23 09 93 for sequence of operations.

2.06 SUBSTANTIAL COMPLETION

A. No portion of the total contract will be declared substantially complete until the automatic temperature controls for that portion has been demonstrated to be complete and functioning as intended. The temperature control system will be complete and functioning as intended when all of the space temperatures are maintained at plus or minus two degrees of set point.

B. Engineer shall have access to the control system graphics via the internet to review and evaluate control system operation.

END OF SECTION 23 09 23

SECTION 23 09 93
SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 ELECTRIC METERS

A. Monitor electrical service displaying data available from the specified meters listed below. Calculate and trend total KVA and KWH. Calculate and display KW/ton for HVAC equipment on home screen.

1. Main Switchboard MSB
2. Panel LK
3. Panel HK
4. Panel OLK

1.03 FLOW METERS

A. Monitor flow rate and display data for the specified meters listed below.

1. Chilled water line serving building
2. Main domestic water line
3. Domestic cold water meter serving kitchen & kitchen water heater
4. Gas meter building
5. Gas meter serving kitchen water heater
6. Gas meter serving kitchen equipment

1.04 OUTDOOR LIGHTING CONTROL

A. Provide new control zones as described on the electrical drawings.

PART 2 – SEQUENCE OF OPERATION

2.01 GENERAL REQUIREMENTS

A. Energy management system monitors building conditions 24 hours per day. Incorporate optimum start programming to all sequence of operations.

B. Systems with thermostats that control both heating and cooling shall be programmed to have an operator selectable dead band. Initially set dead band to 5°F.

C. Chiller safety status point shall be wired so that the BAS recognizes all chiller panel alarms, chilled water proof of flow and condenser water proof of flow regardless of chiller staging.

D. For unit requiring custom filter rack, contact manufacturer *Joe W. Fly Company Inc*.

E. Refer to Drawings for additional requirements

2.02 SYSTEM START/STOP

A. If any equipment requires chilled water for cooling, the building system pumps shall operate. If any equipment requires heating water for heating, the building system pumps shall operate.

B. Each air handling unit or unitary equipment shall have an individual schedule of operation.

2.03 CHILLED WATER SYSTEM

A. If any air handling unit is on and requesting cooling, building pump is energized. If the pump fails to start, energize backup pump. The lead/lag status of the building pumps shall be alternated daily, weekly or monthly. If the pressure in the system 2/3 down the piping system is higher than set point, modulate variable frequency drive to limit maximum pressure.

B. If the building pumps are started, the lead chiller is signaled to start. Chiller will start its own pump, check safeties and then start and maintain setpoint supply water temperature. Whenever the temperature in the chilled water decoupling pipe is not 2°F cooler than building return water temperature or the chiller supply temperature is not at set point for 15 minutes, the second chiller shall be started in the same sequence as the first. The chillers shall be constantly monitored for percent of capacity loading and chilled water supply/return temperatures at each chiller. If the both chillers is operating at 40% or less and the chilled water supply temperature has been maintained for 30 minutes or more, the lag chiller shall be stopped. When a chiller is de-activated, its associated pump shall continue to run 2 minutes (adjustable) before stopping.

C. The EMS shall constantly monitor the operation of the chillers and pumps. If a chiller or pump should fail, an alarm shall be sent operator's work station. The operator shall be able to override any sequence, set point, alarm or chiller/pump selection from the remote location.

D. The EMS shall calculate building tonnage based on system flow and supply/return water temperatures. Calculation shall be smoothed by time averaging.

2.04 HEATING WATER SYSTEM

A. If the outdoor/indoor air temperature is such that heating will be required, hot water pump and lead boiler shall be pre-started to warm loop temperature prior to starting the air handling units. The building hot water pump shall be activated and operated by VFD to maintain system pressure.

B. If hot water loop temperature is below setpoint and the system pump is operating, the lead boiler shall be enabled and shall operate on its internal controls, but monitored by the EMS.

C. If the lead boiler is unable to attain loop temperature after a preset time, the lag boiler system shall be started and operate on their internal controls, but monitored by the EMS.

D. System temperature shall be reset so that it is 120°F with 60°F outside air temperature and 160°F with 30°F outside air temperature. Should the boiler be unable to achieve set point by more than 17°F, the lag boiler starterd shall be started.

E. If outside air temperature is less than 30°F and no air handling units are ON, start hot water pump, open heating water coil valves and circulate 160°F water without starting air handling unit fans.

F. The EMS shall constantly monitor alarm contact provided with the boiler. If boiler should fail to fire, the lag boiler system shall be started and an alarm sent to the operator's work station. Boiler lead/lag order shall alternate weekly.

G. The EMS shall monitor boiler room CO level and send an alarm to the operator's work station.

2.05 SINGE ZONE AIR HANDLING UNIT

A. Unit shall be controlled by DDC controller that shall receive start/stop signal from the central EMS. Controller shall monitor cooling coil leaving air temperature and modulate chilled water valve to maintain leaving air temperature setpoint 55˚F. Controller shall monitor space temperature and modulate fan speed between 50% and 100% to maintain space temperature. If fan speed is at 50% and space temperature is still dropping, heating coil valve shall modulate to maintain space temperature setpoint. If more heating is required in the space, fan speed shall then be modulated from 50% and 100% as required. On high humidity sensing of 55%RH or greater, chilled water valve shall be fully opened, fan speed at full speed, and hot water valve modulate to maintain space temperature setpoint. Cooling coil valve shall drive to full open position on loss of control signal. Heating coil valve shall drive to the full closed position on loss of control signal.

B. EMS shall monitor CO2 level in space and modulate pretreated outside air damper as required to maintain setpoint of 700 PPM (adjustable).

C. Fan and filter status shall be based on differential pressure sensors.

D. Fire alarm system shall disable fan through starter interlock when in alarm.

E. Safety devices and circuits such as low limit sensors, high limit sensors, fire alarm contacts and high-pressure cutout shall operate whether the starter is in Auto or Hand position.

F. Economizer function: When outdoor temperature and humidity readings are below 72°F and 50%RH, unit shall call for 100% outside air delivery regardless of CO2 level reading. This function shall be active until heating of the space is called for.

G. Sequence for Kitchen and AHU-1:

1. If kitchen hoods are in operation, the VFD to control maximum CFM supplied by AHU-1 to 4,500 CFM. When kitchen hoods are off, AHU-1 to operate by temperature sensor.

2. Motorized damper to kitchen relief vent (RV-5) shall close when kitchen hoods are in operation. Otherwise, the motorized damper shall remain open during building occupancy schedule.

3. Motorized damper to ATS room shall open when AHU-1 is running and hoods are off, and the damper from EF-14 shall close. When AHU-1 is not running, the damper from EF-14 shall open and the damper from the building air shall close.

2.06 VAV AIR HANDLING UNIT

A. Unit shall be controlled by DDC controller that shall receive start/stop signal from the central EMS. If the unit is scheduled to be on and cooling is required, fan shall start. Outside air damper or fan shall start/open to preset position. Chilled water valve shall modulate to maintain 53°F supply air temperature. Associated VAV boxes shall be enabled. If building temperature is less than 65°F, associated VAV boxes shall be enabled and heat the building to above 65°F before starting AHU fan, energizing outside air fan or opening outside air damper, and enabling chilled water valve. For unit with hot water heating coil in outside air duct, hot water control valve shall modulate to maintain air temperature of 55°F. During warmup period, the minimum CFM setpoint of the VAV units shall be 50%.

B. The control system shall monitor all the VAV box cold air damper positions and adjust the unit fan speed as required to maintain duct static pressure of 1.5” wc at 2/3 length of longest duct run. Duct pressure sensor located in duct shall limit fan speed through variable frequency drive to limit static pressure to 3.5” wc., and send alarm to the operator’s workstation.

C. Any time the outside air/return air mixed temperature falls below 35°F, supply fan shall be de-energized, chilled water valve opened, system chilled water pump energized, building heating water pump energized and outside air damper closed.

D. Outside air fan or damper shall close on loss of signal, loss of electric power or when AHU fan is off.

E. Fan status shall be based on differential pressure sensors.

F. Fire alarm system shall disable fan through starter interlock when in alarm, and send alarm to the operator’s workstation.

G. Safety devices and circuits such as low limit sensors, high limit sensors, fire alarm contacts and high-pressure cutout shall operate whether the starter is in Auto or Hand position.

H. Associated VAV boxes shall maintain zone setpoint temperatures by modulating cold air damper and sequencing on heating coil valve. Minimum setting of cold valve shall be adjustable with initial set point of 50%. Fan shall run constantly when box is enabled.

I. Economizer function: When outdoor temperature and humidity readings are below 72°F and 50%RH, unit shall call for 100% outside air delivery regardless of CO2 level reading. This function shall be active until heating of the space is called for.

2.07 OUTSIDE AIR PRETREATMENT UNITS

A. Unit shall be controlled by DDC controller that shall receive start/stop signal from the central EMS based on occupancy schedule. Controller shall modulate variable frequency drive to maintain duct static pressure setpoint and sequence preheat coil valve and chilled water coil valve to maintain leaving air temperature of 55˚F. Zone air valve shall modulate damper to maintain CO2 level setpoint of each zone. Variable frequency drive shall limit pressure in supply duct to 1.5” (adjustable) static pressure. Controller shall stop unit if duct pressure exceeds 2.5” (adjustable) static pressure.

B. Fan and filter status shall be based on differential pressure sensors.

C. Fire alarm system shall disable fan through starter interlock when in alarm.

D. Safety devices and circuits such as low limit thermostats, high limit thermostats, fire alarm contacts and high-pressure cutout shall operate whether the starter is in Auto or Hand position.

2.08 OUTSIDE AIR FANS AND DAMPERS

A. Outside air fan shall operate on its own schedule and be interlocked with its associated air handling unit. Outside air shall not be allow to operate during building warm-up / cool down mode. Fan volume shall be varied between minimum and maximum settings based on CO2 level reading in return air system. Damper shall be equipped with end-switch for proof of position prior to fan activation. If associated air handling unit return air temperature is less than 40°F, fan shall be de-energized.

2.09 MDF/IDF A/C UNITS

A. DDC controller monitors/display space temperature and provide alarm when setpoint range is exceeded. Unit operates independently with electric thermostat and internal controls.

2.10 EXHAUST FANS

A. Exhaust fans are opened based on occupancy schedule and override condition. Fans with local switch shall operate only if switch is on and scheduled to be on. Fans with associated thermostats shall have shall space sensor and by cycled by EMS control to maintain setpoint temperature. Group start certain fans as presently configured.

2.11 EMERGENCY SHUTDOWN

A. Provide an emergency shutdown push button switch in the administration area that stops all air conditioning equipment in an orderly fashion. This includes stopping exhaust fans and outside air units immediately. Other air handling units, chillers and equipment shall be shut down in an orderly manner so as to not damage the equipment. Once stopped, the system may only be restarted from resetting of the shutdown switch. Install switch at the following locations:

2.12 UTILITY MEASUREMENT

A. System shall totalize water, gas and electrical usage of the building. Provide suitable metering devices to provide input to the energy management system. All meters shall be located inside the building in mechanical/AHU rooms. Additionally, provide data point and sensors to support the EcoScreen building information software to display water usage, electricity usage and natural gas usage.

2.13 CARBON MONOXIDE LEVEL MONITOR AND GAS SHUTOFF

A. EMS shall monitor CO level in each room with gas burning equipment and shutoff gas valve when setpoint is exceeded. Location to be monitored shall be boiler room, kitchen, and mechanical room with a gas water heater/s. Alarm shall be sent to main control computer at Maintenance Center.

2.14 ELECTRICAL DRINKING FOUNTAINS

A. BAS to control drinking fountain receptacles via contactor.

2.15 MARQUEE SIGN

A. BAS to control Marquee sign general lighting and signage via contactor.

2.16 VENDING MACHINES

A. BAS to control vending machines via contactor.

2.17 LIGHTING

A. Contactors for wall packs, canopy lights, Marquee, and parking lot pole night lights are to be programed to come on 30 minutes before sunset and go off 30 minutes after sunrise seven days a week.

B. Contactors for the other parking lot pole lights are to be programed to come on 30 minutes before sunset Monday thru Friday and off at 12:00am (midnight), and they shall be programmed to come on Monday morning through Friday morning at 5:00am and off 30 minutes after sun rise.

C. Points for all electrical contactors are to be named the same as final PISD approved contactor labels for type of lighting/load and location

2.18 TEMPERATURE SETPOINTS

Room Temperature	74°F
Chilled Water Temperature	44°F
Heating Water Temperature	Reset Schedule
VAV Cooling Coil Leaving Air Temperature	53°F

Humidity Sensors	55%
Duct Pressure Control Level	1.5" wg
Duct Pressure Saftey Limit	4.0" wg

2.19 POINT CONFIGURATION

EQUIPMENT	CONTROL FORM
CHILLER MANAGER PROGRAM:	
EACH SYSTEM PUMP	MODULATING CONTROL
EACH SYSTEM PUMP STATUS	DATA POINT
EACH SYSTEM PUMP RUN TIME	REPORT POINT
EACH SYSTEM PUMP RUN	ENERGIZE
BUILDING CHW SUPPLY	TEMP READING
BUILDING CHW RETURN	TEMP READING
DE-COUPLER PIPE	TEMP READING
BUILDING FLOW	FLOW READING
TEMPERATURE HIGH LIMIT	ALARM POINT
TEMPERATURE LOW LIMIT	ALARM POINT
SYSTEM PRESSURE	PRESSURE READING
EACH CHILLER:	
CHILLER RUN	ENERGIZE
CHILLED WATER PUMP RUN	ENERGIZE
CHILLED WATER RESET	MODULATING
CHILLED WATER SUPPLY	TEMP READING
EQUIPMENT FAILURE STATUS	ALARM POINT
CHILLED WATER TEMPERATURE HIGH LIMIT	ALARM POINT
CHILLED WATER TEMPERATURE LOW LIMIT	ALARM POINT
CHILLED WATER PUMP STATUS	DATA POINT
CHILLED WATER PUMP RUN TIME	REPORT POINT
CHILLER SAFETY STATUS	DATA POINT
CHILLER OPERATING LOAD (KW/TON)	DATA POINT
CHILLER RUN TIME	REPORT POINT
BOILER MANAGEMENT PROGRAM:	
BUILDING HEATING WATER PUMP RUN	MODULATING CONTROL
EACH BOILER	ENABLE
BOILER FAILURE STATUS	ALARM POINT
BUILDING HEATING WATER SUPPLY	TEMP READING
BUILDING HEATING WATER RETURN	TEMP READING
TEMPERATURE HIGH LIMIT	ALARM POINT
TEMPERATURE LOW LIMIT	ALARM POINT
HEATING WATER PUMP STATUS	DATA POINT
CARBON MONOXIDE LEVEL	ALARM POINT

EACH SYSTEM PUMP STATUS	DATA POINT
EACH SYSTEM PUMP RUN TIME	REPORT POINT
EACH SYSTEM PUMP RUN	ENERGIZE

EACH SINGLE ZONE AIR HANDLING UNIT (VAV UNIT):

FAN RUN	ENERGIZE
OUTDOOR AIR DAMPER/FAN	ENERGIZE
CHILLED WATER VALVE	MODULATING CONTROL
HEATING WATER VALVE	MODULATING CONTROL
VARIABLE FREQUENCY DRIVE	MODULATING CONTROL
DUCT STATIC PRESSURE	PRESSURE READING
ZONE SUPPLY AIR TEMPERATURE	TEMP READING
SMOKE DETECTOR/FIRESTAT	ALARM POINT
EQUIPMENT FAILURE STATUS	ALARM POINT
TEMPERATURE HIGH LIMIT	ALARM POINT
TEMPERATURE LOW LIMIT	ALARM POINT
FAN STATUS	DATA POINT
RUN TIME	REPORT POINT

EACH SINGLE ZONE AIR HANDLING UNIT:

FAN RUN	ENERGIZE
CHILLED WATER VALVE	MODULATING CONTROL
HEATING WATER VALVE	MODULATING CONTROL
ZONE TEMPERATURE	TEMP READING
ZONE SUPPLY AIR TEMPERATURE	TEMP READING
ZONE HUMIDITY LEVEL	RH READING
ZONE CO2 LEVEL	CO2 READING
OUTDOOR AIR DAMPER	MODULATING CONTROL
SMOKE DETECTOR	ALARM POINT
EQUIPMENT FAILURE STATUS	ALARM POINT
TEMPERATURE HIGH LIMIT	ALARM POINT
TEMPERATURE LOW LIMIT	ALARM POINT
FAN STATUS	DATA POINT
RUN TIME	REPORT POINT

OUTSIDE AIR PRETREATMENT UNIT:

FAN RUN	ENERGIZE
CHILLED WATER VALVE	MODULATING CONTROL
HEATING WATER VALVE	MODULATING CONTROL
HEATING AIR TEMPERATURE	TEMP READING
COOLING AIR TEMPERATURE	TEMP READING
OUTDOOR AIR DAMPER	OPEN/CLOSE
SMOKE DETECTOR	ALARM POINT
EQUIPMENT FAILURE STATUS	ALARM POINT
TEMPERATURE HIGH LIMIT	ALARM POINT
TEMPERATURE LOW LIMIT	ALARM POINT
FAN STATUS	DATA POINT
RUN TIME	REPORT POINT

TEMPERATURE LOW LIMIT	ALARM POINT

EACH FPB TERMINAL:

FAN RUN	ENERGIZE
ZONE TEMPERATURE	TEMP READING
SUPPLY AIR TEMPERATURE	TEMP READING
PRIMARY AIR QUANTITY	FLOW READING
PRIMARY AIR	MODULATING CONTROL
HEATING COIL VALVE	MODULATING CONTROL
MAXIMUM PRIMARY AIR SETPOINT	SETPOINT
MINIMUM PRIMARY AIR SETPOINT	SETPOINT

EACH SUPPLY FAN:

FAN RUN	ENERGIZE
FAN STATUS	DATA POINT
CONTROL DAMPER	MODULATING CONTROL
DAMPER STATUS	DATA POINT

EACH EXHAUST FAN:

FAN RUN	ENERGIZE
FAN STATUS	DATA POINT

MDF/IDF:

ZONE TEMPERATURE	TEMP READING

MISCELLANEOUS:

EMERGENCY SHUTDOWN	ENERGIZE
BOILER ROOM CO MONITOR	ALARM POINT
OUTDOOR AIR TEMPERATURE	TEMP READING
OUTDOOR HUMIDITY	HUMIDITY READING
EMERGENCY GENERATOR WARNING	ALARM POINT
CHILLER PLANT REFRIGERANT SENSOR WARNING	ALARM POINT
EACH VAV AHU MECHANICAL ROOM RETURN AIR	CO2 READING
COOLER & FREEZER TEMPERATURE	TEMP READING
ELECTRICAL POWER METER (4)	KWH INPUT
ELECTRICAL SERVICE PHASE FAILURE	ALARM MONITORING
BUILDING CHILLED & HOT WATER FLOWMETER (2)	TOTAL QUANTITY
KITCHEN AHU WATER FLOWMETER (2)	TOTAL QUANTITY
DOMESTIC WATER METER (2)	TOTAL QUANTITY
NATURAL GAS METER (3)	TOTAL QUANTITY
IRRIGATION METER	TOTAL QUANTITY
COOLING TOWER MAKE-UP WATER METER	TOTAL QUANTITY
LIGHTING CONTROL (COORDINATE WITH ELECTRICAL)	ON/OFF

END OF SECTION 23 09 93

SECTION 23 21 13
HVAC HYDRONIC PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Construct all piping systems in accordance with applicable ASME Codes. Provide a vent valve at the topmost part and a drain valve at the lowest part of all water piping systems.

B. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops. Piping in the vicinity of equipment shall be arranged to not interfere with access panels and maintenance space. Provide unions, flanges and shutoff valves to allow removal of the equipment and its subassemblies without having to remove excessive amounts of building piping or drain water systems. Bull head Tee arrangement is not acceptable.

C. Provide pipe markers per Section 23 05 53.

D. All piping, fittings and valves shall be manufactured in the United States of America.

PART 2 – METHODS

2.01 PIPE SUPPORTS

A. GENERAL: Provide supports of adequate strength for all piping. Piping connected to a piece of equipment shall have a support located near enough to the equipment that there will be no pipe weight supported by the equipment. In no case shall the nearest support be more than two feet horizontally from the connection point. Pipe support material shall be selected to be compatible with the pipe material to prevent galvanic corrosion. The minimum size hanger rod shall be 3/8”.

B. HORIZONTAL PIPING:

1. SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than below:

Pipe Size	Steel Pipe	Other Pipe
1" & Smaller	6 Feet	4 Feet
1¼" & 1½"	8 Feet	5 Feet
2"	8 Feet	5 Feet
2½" to 4"	8 Feet	6 Feet
6" and Larger	8 Feet	6 Feet

Multiple parallel runs of 4” and larger piping shall be supported from every joist and beam the piping crosses. Where piping runs parallel to structure support from three adjacent joists or beams.

2. SUPPORT FROM ABOVE: Support piping near roof or upper floor from structure if sufficient strength exists. Use a method suitable for type of construction and of sufficient strength. Use threaded steel hanger rods of diameter required to safely support loads. Install rods through holes drilled in beam flanges, 1½" x 1½" x 8" angles welded to structural members or top cord slot at joist panel points and secure with large washers and nuts. Refer to structural drawing details for additional information. Do not use perforated strap.

3. HANGERS: Manufactured by Grinnell or Tolco.

   a. SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

   b. MULTIPLE RUNS: Trapeze hangers.

4. SUPPORT FROM BELOW: All piping near the floor, or where ceiling structure does not have sufficient strength, or where there is no ceiling shall be supported from below. Support members shall be steel pipe with base plates, or welded steel structure suitably braced.

5. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel. Provide solid copper supports for copper piping, or install gas wrap insulating tape on pipe at support point.

6. PIPE SADDLES: Install 18 gauge, 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, 16” minimum length. Provide compressible gasketing between non-insulated plastic pipe and hangers. Provide insulating material between dissimilar metal.

7. TRAPEZE SUPPORTS: Shall consist of unistrut or channel with 3/8” thick or heavier all thread rods attached to structure. Provide double nuts and cut all tread so no more than 1” extends beyond nut.

2.02 VALVE INSTALLATION

A. Install in accessible locations, to make possible removal of bonnet and complete servicing of each valve. Do not install valve with stem down

2.03 TESTING PIPING SYSTEMS

A. GENERAL: Test all piping systems to assure that they are absolutely leak free. Pipe to be insulated shall be proved leak free before pipe is concealed. Architect shall be notified when testing is performed so that the Engineer and/or Owner may observe and certify the results.

B. PRESSURE TEST METHOD: Use method suitable for type of piping system being tested. For pressure pipe, use a test pressure approximately 150% of maximum system working pressure but at a minimum pressure of 60 psig. The minimum test pressure for chilled water and heating water shall be 1.5 times the operating pressure. Maintain pressure for 24 hours. During this test period, inspect all pipe fittings and accessories in the piping and eliminate all leaks.

C. FINAL TEST: Subject each piping system to its normal operating pressure and temperature for not less than twenty-four hours. The piping systems 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. Pipes that will contain water shall be leak tested with water.

D. All testing shall be observed by architect/engineer and school district personnel.

2.04 SLEEVES

A. Provide sleeves for all piping passing through walls, floors not on grade and roof slabs. Make sleeves of galvanized pipe and sized to provide clearance of 1/4" around piping or pipe insulation if pipe is insulated. Set end of sleeve flush with the surrounding surface of wall or ceiling in which sleeve is installed. Floor slab sleeves shall extend 3" above floor level. Provide vented sleeves for all gas piping below floor slabs or paved areas.

2.05 PLATES

A. Provide chromium plated wall and ceiling plates for all exposed piping, at point piping passes through walls or ceilings. Plates shall be large enough to completely cover pipe sleeves. On insulated piping, inside diameter of plates shall just exceed outside diameter of pipe covering. Plates may be omitted for pipe sizes larger than 6".

2.06 VALVE AND FITTING SIZES

A. All hand valves, fittings and other piping accessories shall be size of the line in which installed unless specifically indicated otherwise on the Drawings.

2.07 DIELECTRIC UNIONS

A. Provide dielectric insulating unions at all connections between dissimilar metals.

2.08 FITTINGS

A. SCREWED: Conform to ANSI Specification B16.3.

B. COPPER: Conform to ANSI Specification B16.22. T-drill fittings are not acceptable.

C. WELDED: Install elbow, transition, branch and weld-o-let lateral fittings in welded systems. Mitered or field fabricated fittings are not acceptable. Flanges shall be weld neck type for sizes 6” and larger pipe.

D. SPECIAL: Use long radius ells on all pumped lines.

E. Pipe 2" and smaller - threaded fittings.

F. Pipe 2 ½"' and larger - welded.

G. Pressure fittings and Victolic are not allowed.

2.09 VALVES

A. GENERAL: Provide shutoff/balancing valve for each water connection to equipment that is piped to the condenser, chilled or heating water systems. All pressures shown below are minimum working pressures. Provide memory stops for valves used for throttling service. Provide chain operators with guide for all valves 6" and larger, located higher than 8 feet. Loop chain with bottom 7 feet high. Provide close-off plugs or plates for all valves in dead end service or otherwise opening to the atmosphere (drains, manual vents, future extensions, etc.).

B. BALL VALVE FOR MECHANICAL SYSTEMS: Provide for 2" and smaller pipe: 600 PSI WOG, bronze threaded, full port, Teflon seat, stainless steel trim, extension stem for insulation. Nibco T-585-70-66(-NS). Ball valves for strainer blow down and drains shall have hose end connection and attached cap. Nibco T-585-70-66-HC. Valves used for air venting may be non-full port type with chrome plated ball. Nibco T-580-70.

C. GATE VALVE FOR MECHANICAL SYSTEMS: Provide for steel pipe 2½" and larger only: 125# iron body, bronze fitted, flanged, bolted bonnet, solid wedge, OS&Y. Nibco F-617-0.

D. PLUG VALVE FOR MECHANICAL SYSTEMS: Bronze or iron body, screwed for 2" and smaller, flanged for 2½" and larger, eccentric plug with compressible resilient seal suitable for 250° F water service, permanently molded to plug face, permanently lubricated corrosion resistant bearing bushings, lever actuator. DeZurik Series 100 and 400

E. CHECK: 2" and under, 125# bronze body, bronze swing check with Teflon seat; 2½" and over 125# iron body, flanged, bronze trim. Use Duo-Check for pumped lines. Nibco T-413-B, Nibco F-918-B, Nibco W-920-W (Wafer) and Keystone FIQ810.

F. BUTTERFLY: 2½" and larger, 200# full lug ductile iron type body, stem seals, molded in or renewable seat, aluminum bronze disc, 416 stainless steel stem, extended neck for insulated lines, notched top plate with handle for throttling. Valves 6" and larger and valves with chain operators, to have enclosed weatherproof gear operator. All valves certified suitable for dead end service with no downstream flange. Nibco LD-2000 or Keystone Figure 222.

G. MISCELLANEOUS VALVES: As indicated on the Drawings.

H. INSULATION PROVISIONS: Valves on insulated lines shall have stems extending through insulation. Plug valves shall have DeZurik 400 dry cap. All ball valves shall have Nibco Nibseal system installed. Heating water valves inside do not require Nibseal system.

I. INSTALLATION: Ball valves shall be installed such that handle for valve is positioned on the side of the pipe and is pulled down to close the valve.

J. ACCEPTABLE MANUFACTURERS: Crane, De Zurik, Grinnell, Kitz, Milwaukee, Nibco and Stockham

2.10 STRAINERS

A. STRAINERS: Iron body, Y pattern basket type, line size, not more than 2 PSIG pressure drop, 20 mesh Monel screen unless indicated otherwise. Provide ball valve with end plug for blow-off

on strainers. Chilled and hot water strainer baskets to have 1/16" perforations. Condenser water strainer baskets to have 1/8" perforations.

B. SUCTION DIFFUSERS: Flanged type with strainer area five times suction area, straightening vanes with length 2½ times suction diameter, magnetic insert, reducing flange as required and adjustable floor support. All internal parts shall be replaceable.

C. ACCEPTABLE MANUFACTURERS: Keckley and Taco

2.11 WATER SPECIALTIES

A. GENERAL: Provide all specialties necessary for proper operation of the water systems. Install manual air vents at all high points on chilled and hot water lines and automatic vents where shown. Install T&P relief valves in all closed water piping systems.

B. TEMPERATURE AND PRESSURE RELIEF VALVES: ASME labeled, with try handle, discharge pressure rating approximately 10 PSI above normal maximum system operating pressure; except valves on hot water boilers to be rated at 30 PSI, with capacity not less than rated output of boiler.

C. AUTOMATIC AIR VENTS: Bell & Gossett No. 107A high capacity vent, 150 psi rating, with shut-off cock, and 1/2" copper tube overflow line extended to a suitable drain point.

D. MANUAL AIR VENTS: 1/2” ball valve with plug.

E. CAPTIVE AIR EXPANSION TANKS: 125 PSI rated, captive air type with charging valve and replaceable bladder designed for 100% acceptance.

F. AIR SEPARATORS / AIR AND DIRT ELIMINATORS: Shall have tangential inlet and outlet connections, top tank fitting, PALL ring technology, drain/blow down valve and be constructed to ASME applicable codes for 125 PSIG working pressure. Taco Model 4900-AD. Thrush – Aar-o-vent. Spirotherm - Spirovent

G. TEST PLUGS: Provide Pete's Plugs or Texas Fairfax test plugs at inlet and outlet of each pump, AHU water coil, strainer, control valve and chiller cooler and condenser bundle. Provide extension where piping is insulated. Provide two sets of temperature and pressure gages for use with the Pete's Plugs. Gages to be of appropriate scale for system measurements.

H. GAGES: 4½" dial diameter, bottom connected, flangeless, fiberglass reinforced polypropylene, brass or aluminum moisture and dust proof case with blowout plug or blowout back, screw rings, glass crystal and silicone dampened, bronze brushed rotary movement. Pressure range 0 to 150% of system working pressure. Provide brass TEE handle shut off for each gage with minimum rating same as gage. Manufacturers: Ashcroft, Marsh, Marshalltown, Scientific, Trerice, Weiss or Weksler.

I. THERMOMETERS: Outdoor thermometers shall be cast brass or cast aluminum case with brass separable sockets (with extension neck for insulated piping); blue reading non-Mercury type with 9" scale for maximum and minimum to be encountered. Chilled and condenser water range to be 30° F to 130° F, 2° divisions. Hot water range shall be 30° F to 240° F, 2° F divisions. For thermometers at or below 6 feet high, install scale vertical. For thermometers above 6 feet high

provide adjustable angle type. Install scale at 45° facing down for easy reading. Weiss Model 9VU35. Indoor thermometers shall be solar powered digital type. Weiss Model DVU35. Equal thermometers by American, Marshalltown, Scientific, Taylor, Trerice and Weksler are acceptable.

J. THERMOMETER WELLS: Weksler Test Wells, brass with 3½" stem, 2½" extension neck, and brass screw plug, or comparable models made by American, Marshalltown, Scientific, Taylor, Trerice or Weiss.

K. ACCEPTABLE MANUFACTURERS: Aurora, Bell & Gossett, Keckley, McDonnell-Miller, Taco, Thrush, Wood Industrial Products, and Wessels.

2.12 MISCELLANEOUS PIPING

A. GENERAL: Provide all required piping not specifically shown on the drawings but necessary for the proper operation of the systems. Piping materials, methods of installation, fittings, valves, etc., shall conform, in general, to that specified for similar piping systems.

B. CONDENSATE DRAINS: From each air conditioning unit drain pan to drain indicated, or to a suitable drain point if not indicated. All lines graded down in direction of flow. Provide trap of height required for air seal. Provide screw plug cleanout at change of direction to allow rodding.

C. MISCELLANEOUS DRAINS: Provide copper drain line to floor drain from automatic air vents, backflow preventers, relief valves and other equipment with automatic drains.

2.13 PIPE WELDING

A. GENERAL: All welds shall be made using shielded arc process. Welding shall be performed by experienced and highly skilled workmen, holding current certification by the National Certified Pipe Welding Bureau or currently certified under the requirements of the ASME Boiler and Pressure Vessel Code, Section IX. Piping and fittings shall be welded and fabricated in accordance with ASME/ANSI the latest edition of Standard B31.9 for all systems. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards. Welding process shall ensure complete penetration of deposited metal with base metal. Provide fill metal suitable for use with base metal. Keep inside of fittings free from globules of weld metal. All piping shall have the ends beveled 37-1/2° and joints shall be aligned true before welding. All changes in direction, intersections of lines, reduction in pipe size and the like shall be made with factory fabricated welding fittings. Mitering of pipe to form elbow, mating of straight runs to form tees or similar construction will not be permitted. Do not split, bend, flatten or otherwise damage piping before, during or after installation. Remove dirt, scale or other foreign matter from inside piping before tying in section, fitting, valve or equipment.

B. PASSES: After tack welding sections for alignment purposes, make one welding pass completely around joint. Make additional passes until the joint is completed. After each pass, wire brush and/or grind weld to remove slag deposits and prepare the surface for additional passes. Schedule 40 pipe shall be welded with no less than three passes, including one stringer/root, one fillet and one lacer. Schedule 80 pipe shall be welded with no less than four passes including one stringer/root, two fillets and one lacer. In all cases, the weld must be filled before the cap weld is added.

C. APPEARANCE: The finished weld shall have no surface voids and present a raised bead at the joint. Wire brush joint for a finished appearance.

D. TESTING: All welds are subject to inspection, visual and/or X-ray, for compliance with the specifications. The A/E will, at A/E's option, provide employees or employ a testing laboratory for the purposes of performing inspections and/or testing. If X-ray testing finds unacceptable welds, the Contractor shall be responsible for all labor, material and travel expenses involved for the first testing, as well as all re-inspection and testing that may be required to ensure compliance. The Contractor shall be responsible for costs of all additional testing required as recommended by ASME/ANSI Standards B31.9 due to discovery of unacceptable welds. Welds lacking penetration, containing excessive porosity of cracks or are found to be unacceptable for any reason, must be removed and replaced with an original quality weld as specified herein.

2.14 GROOVED PIPING SYSTEM

A. GENERAL: The grooved coupling system may be used at contractor's option, except in all cases provide a sufficient quantity of Victaulic flexible type mechanical couplings in straight pipe runs to compensate for expansion.

B. PIPE: Use only those pipe materials allowed in the Specifications and approved by the coupling manufacturer for the application. Pipe grooves shall be machine cut for schedule 40 pipe.

C. COUPLINGS: Housings shall be ductile or malleable iron constructed to ASTM A-47 or A-536, or forged steel constructed to ASTM A-106. Coupling gaskets shall be EPDM Grade E for -30° F to 230° F service. Couplings shall be Victaulic Style 77 flexible couplings at first three joints from equipment. Elsewhere use Style 07 for rigid joints or Style 77 for flexible joints.

D. ACCEPTABLE MANUFACTURERS: Gustin Bacon, Grinnell Gruvlok and Victaulic

2.15 PAINTING

A. Condenser water piping shall be painted beige with two coats of industrial, epoxy enamel paint. Prepare surface by wire brushing to remove surface rust and welding slag. Coats shall be thick enough to ensure a uniform, smooth surface without noticeable print through of the underlying material.

PART 3 – MATERIALS

3.01 CHILLED AND BUILDING HEATING WATER PIPING

A. Schedule 40 black steel pipe and fittings, long radius ells, screwed, or welded type mechanical couplings. Piping shall be of domestic manufacture and meet ASTM ERW A-53 Grade B. Provide a sufficient quantity of Victaulic flexible type mechanical couplings in straight pipe runs to compensate for expansion. All bolts, nuts and all thread used in the piping system and components shall be cadmium plated to resist rust. Pipe connections to fan coil units shall be approximately two feet of Type L copper with wrought copper solder fittings braised. See Section 3.6 for underground piping.

3.02 CONDENSER WATER PIPING

A. INSIDE BUILDING: Schedule 40 black steel pipe and fittings, long radius ells, screwed, or welded type mechanical couplings. Piping shall be of domestic manufacture and meet ASTM ERW A-53 Grade B. All bolts, nuts and all thread used in the piping system and components shall be cadmium plated to resist rust.

B. OUTSIDE BUILDING: Schedule 40 galvanized steel pipe and fittings, long radius ells mechanical couplings. Piping shall be of domestic manufacture and meet ASTM ERW A-53 Grade B. All bolts, nuts and all thread used in the piping system and components shall be cadmium plated to resist rust.

3.03 CONDENSATE DRAIN PIPING

A. Schedule 40 galvanized steel or Type "L" copper with solder wrought fittings brazed.

B. Use threaded plugged tee at each change of direction to permit cleaning.

C. Install a cleanout every 50 feet of straight run piping.

D. Maintain a positive slope on all piping.

E. Use 15% silver solder.

MISCELLANEOUS PIPING

A. Schedule 40 galvanized steel or Type "L" copper with solder wrought fittings brazed.

END OF SECTION 23 21 13

SECTION 23 21 23
HYDRONIC PUMPS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General Mechanical

PART 2 – PRODUCTS

2.01 END SUCTION WATER PUMPS

A. GENERAL: Pumps shall be base mounted with flexible coupling. End suction pumps shall be back pullout type with cast support from the casing.

B. CONSTRUCTION: Pumps shall be bronze fitted with iron or steel casing, casing wearing ring, shaft sleeve, drip proof motor, cast iron or steel base, coupling guard, grease fittings and mechanical shaft seals. Impeller shall be statically and dynamically balanced and shall not be larger than 85% of cutwater size. Motor to pump connection shall use Wood's Dura-Flex coupling with 1.5 service factor suitable for variable speed drive applications.

C. CAPACITY: Capacity as scheduled on Drawings. Include cost of re-trimming impeller if required to properly balance the system.

D. MOTOR: Construction and selection shall be non-overloading at selection point and at any point on the curve. Service factor may be used for meeting this requirement except at selection point. See Motors in Section Miscellaneous Equipment and Requirements.

E. ACCEPTABLE MANUFACTURERS: Armstrong, Aurora, Bell and Gossett and Taco.

2.02 CLOSE-COUPLED VERTICAL INLINE PUMPS

A. C.C. VERTICAL INLINE PUMPS: Provide close coupled, NEMA standard JM re-greaseable motor and factory installed vent line from the seal chamber to the pump suction to remove trapped air. Pump shall be designed to allow seal replacement without removing motor.

B. CONSTRUCTION: Pumps shall be bronze fitted with iron or steel casing, casing wearing ring, shaft sleeve, drip proof motor, cast iron or steel base, coupling guard, grease fittings and mechanical shaft seals. Impeller shall be statically and dynamically balanced and shall not be larger than 85% of cutwater size. Motor to pump connection shall use Wood's Dura-Flex or Omega coupling with 1.5 service factor suitable for variable speed drive applications.

C. CAPACITY: Capacity as scheduled on Drawings. Include cost of re-trimming impeller if required to properly balance the system.

D. MOTOR: Construction and selection shall be non-overloading at selection point and at any point on the curve. Service factor may be used for meeting this requirement except at selection point. See Motors in Section 23 05 13. MOTORS SHALL BE TEFC TYPE.

E. ACCEPTABLE MANUFACTURERS: Armstrong, Aurora, Bell and Gossett and Taco.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

3.02 EQUIPMENT PADS

A. Provide 4" thick concrete pad for each floor mounted pump. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge.

3.03 SPARE PARTS LIST

A. Provide the followings.

1. Extra mechanical seal for each vertical inline close coupled pump and extra spacers for motor removal.

2. Set of bearings for each pump.

3. Ten water filters per each pump that has a filter for the seals.

END OF SECTION 23 21 23

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General Mechanical

PART 2 – PRODUCTS

2.01 REFRIGERANT PIPING

A. GENERAL: Provide for the systems as shown. Submit shop drawing of piping system showing all traps, pipe sizes, and accessories; drawing to be marked "Approved and signed by an employee of the Application Engineering Department of the unit manufacturer. Do not install piping until this drawing is submitted and approved. All materials shall be manufactured in USA.

B. MATERIALS:

1. PIPE: Type "K" hard-drawn copper tubing.

2. FITTINGS: Sweat-type, wrought copper streamlined, long radius sweat fitting. No bendable pipe of any kind is not allowed.

3. Brazing: Use 15% silver solder, except on valves use solder recommended by valve manufacturer. Make joints while pipe is under nitrogen purge to prevent formation of oxides inside piping.

C. ACCESSORIES: Replaceable core type liquid line dryer-strainer sized for system capacity at 2 PSI pressure drop per ARI Standard 710-64, sight glass-moisture indicator, expansion valves, solenoid valves and charging fittings.

D. ACCEPTABLE MANUFACTURERS: Alco, Sporlan and Parker

2.02 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.

2.03 BRAZING

A. During the brazing process, dry nitrogen shall be purged through the tubing to keep oxides from forming.

B. Use 15% silver solder

2.04 PRESSURE TESTING

A. After refrigeration and piping system items are installed, charge the system with dry nitrogen and test to 300 psig.

B. Notify the District when this work is to begin.

1. Test joints with a Halide torch or an electronic leak detector.

2. Repair leaks and retest each system until proven tight.

2.05 EVACUATION AND DRYING

A. After the refrigerant system has been pressure-tested, connect a suitable vacuum pump and evacuate the 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.

PART 3 – EXECUTION

3.01 DIELECTRIC

A. Insulate copper pipe from all dissimilar metals, hangers, pipe, etc., with 4 pound/square foot lead shields 6" long wrapped completely around the pipe and placed between hangers and pipe, or elastomeric snubbers of similar design. B-line B1999 vibra cushion and B2000 two-piece clamp.

3.02 FIELD QUALITY CONTROL

A. The installing contractor shall complete the installation and complete a total system pressure test of 550 psi for 24 hours prior to startup.

B. THE MANUFACTURER OR MANUFACTURER’S AGENT SHALL BE RESPONSIBLE FOR ALL EVACUATION AND CHARGING OF REFRIGERANT FOR EACH SYSTEM AT STARTUP. CONTRACTOR STARTUP IS NOT ALLOWED.

C. The manufacturer’s agent shall provide the following startup services:

1. Evacuation of the piping system to a 400 micron vacuum (hold 48 hours)

2. Proper charging of the system with refrigerant (Refrigerant provided and installed by the installing contractor)

3. Execution of all standard diagnostics.

4. Connection to the system with the manufacturer's Service Checker software and creating an operational log of the following information for verification:

    a. Each system operates with proper temperatures, delta T and superheat conditions in both cooling and heating modes.

    b. Each fan coil unit is heating/cooling properly (verification that piping work has been installed properly.

5. A digital copy of these operational logs shall be stored by the manufacturer's agent as well as delivered to the owner with warranty documentation.

END OF SECTION 23 23 00

SECTION 23 25 00
HYDRONIC SYSTEM WATER TREATMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, and the requirements of Section apply to the Work specified in this section.

1.02 GENERAL REQUIREMENTS

A. The service to be provided requires the Sub-contractor to provide complete water analysis, chemicals, testing equipment, training, consulting and technical service in support of the chemical cleaning and treatment of the following systems:

1. HVAC Hot Water Systems

2. Chilled Water Systems

B. Provide the initial chemical treatment for all systems based on a complete water analysis prior to the equipment installation.

1. The initial chemical treatment shall be applied after the systems have been cleaned and flushed.

2. The initial treatment supply of chemicals shall be adequate for the start-up and testing period, for the time the system is being operated by the Contractor for temporary cooling and heating, and for a period of (1) year after Substantial Completion.

3. The Sub-contractor shall recommend a periodic testing procedure and chemical treatment schedule for facility personnel. This procedure is be outlined in the Program Administration Manual (Section 2.02 C).

C. The Sub-contractor shall have a qualified Service Representative on site at the facilities to assist with the initial application of the chemicals and training of the Facility personnel. This Service Representative shall then make two service visits per month for the first two months and service visits at least once a month as specified herein or more often if required to analyze water samples, to inspect the equipment and to make recommendations for continued application of the products. Provide 48 hours advance notice to the Owner of site visits.

D. A service report shall be prepared on site and submitted at the time of each service visit and shall include all required test results and recommendations. Also, proof of training, including training topics and names of trainees, must be provided.

E. The Sub-contractor must provide equipment with electrical characteristics compatible with those shown on the Electrical Drawings.

1.03 ACCEPTABLE MANUFACTURERS

A. All materials and systems shall be new and compatible for use in the Owner's Facility (including compatibility with system pressures, temperatures, etc.). Chemicals complying with this specification and manufactured by the following companies will be accepted.

1. Pasadena ISD Approved Water Treatment Contractor: Chem-Aqua

1.04 SUBMITTAL

A. Follow the submittal requirements of Section 23 00 00. Submit all data to prove compliance with these specifications including but not limited to:

1. Product specification sheets and MSDS's for each chemical used.

2. Cut sheets with technical data on the automated monitoring and control systems and all equipment as specified herein.

3. Shop drawings as necessary to assist the mechanical contractor with proper system installations.

PART 2 – TECHNICAL SPECIFICATIONS

2.01 GENERAL

A. Work covered by this specification consists of providing all cleaning and treatment chemicals, consulting services, training, testing, technical services, equipment and materials necessary for the work herein called for.

B. Guarantee and Service: All materials furnished by the Sub-contractor shall be new, and both workmanship and materials shall be of good quality.

2.02 BASIC SERVICES

A. Routine Services: Sub-contractor's Service Representative shall provide minimum of bi-monthly service for the first two months and monthly service from there on to include consulting and cooling water analyses for conductivity (TDS), "M" alkalinity, hardness, sodium chloride and scale and corrosion inhibitor levels. Any additional visits required shall be at no additional cost to the Owner.

1. Chilled and hot water systems shall be analyzed at least quarterly for nitrite and conductivity.

2. A legible, hand-written or computer generated report shall be prepared at the conclusion of each monthly site visit, showing all test results and providing recommendations for continued systems operations.

B. Training: The Sub-contractor shall provide training for operating personnel on the chemical testing, application and control of the treatment program. Training shall utilize a combination of multi-media lectures and "hands-on" activities. Sub-contractor shall provide verification examples of training materials. Provide 48 hours advance notice and coordinate times with the Owner.

1. Training shall include such tests which are required to satisfactorily monitor the treatment program, including conductivity (TDS), "M" alkalinity, calcium hardness, sodium chloride and scale and corrosion inhibitor levels. Test kits including all necessary reagents for these tests shall be included in the Sub-contractor's proposal.

2. Operating personnel shall be trained on basic chemistry, system operation, testing procedures and safety.

C. Program Administration Manual: The Sub-contractor shall provide the Facility with two Program Administration Manuals including sections covering program control, testing requirements, in-plant logs, safety data and system information. Each section shall include the following:

1. *Program Control*: This section shall include a complete program outline with chemical descriptions, control ranges, and required action for “out of range” situations. It shall also contain complete ordering instructions with applicable account numbers and phone numbers.

2. *Testing Requirements*: This section shall include basic testing practices as well as detailed test instructions for each test being performed by Facility personnel.

3. *In-Plant Logs*: This section shall include detailed testing log sheets for each system to be tested including room to record one month’s data on one sheet and a section to log chemical inventory.

4. *Safety Data*: This section shall include the Sub-contractor’s 24-Hour toll free safety hotline number as well as MSDS sheets for each chemical used.

5. *System Information*: This section shall be provided for any equipment manuals and related information to be stored.

2.03 TREATMENT PROGRAM - CLEANING AND PASSIVATION

A. Hot & Chilled Water System: Treat each piping system with chemicals to remove and permit flushing of mill scale, oil, grease, and other foreign matter and to promote system passivation. Chemicals shall be equal to Nalco NALPREP 2859. Pretreatment shall be accomplished by exposing the system to 500 ppm of NO2 (2700 ppm as Nalco NALPREP 2859), at a pH of 7.0-8.0 for 24-48 hours. Use sulfuric acid if needed to adjust and maintain system pH. Pretreatment and flushing shall be complete before system treatment is added to the system.

2.04 TREATMENT PROGRAMS – QUALITY RESULTS ASSURANCE

A. The hot water and chilled water programs proposed by the Sub-contractor shall be designed to maintain corrosion rates below 0.5 mils per year for mild steel and 0.1 mils per year for copper. These rates should be verified with corrosion coupon racks provided by the Sub-contractor and installed by the mechanical contractor on each hot and chilled water system. Hot and chilled water coupons must be analyzed once a year with a minimum 90-day system exposure. A report of the coupon analytical results shall be provided to the Owner or Owner’s representative.

B. Hot and Chilled water microbiological growth levels shall be maintained below 10,000 cfu’s aerobic bacteria and 10 cfu’s anaerobic bacteria. The Sub-contractor shall perform detailed

microbiological culturing off-site at the Sub-contractor's company's own analytical laboratory annually to determine these levels. A report of the off-site analytical results shall be provided to the Owner or Owner's representative.

2.05 EQUIPMENT

A. GENERAL: All equipment needed to completely install and facilitate designed operation of the Sub-contractor's program given the Facility's operating requirements must be provided in the Bid. The Sub-contractor will be required to provide all necessary shop drawings and consulting to facilitate installation by the mechanical contractor. The following equipment must be provided to meet the specification as listed:

B. Chemical Metering Pumps

1. Chemical metering pumps shall be positive displacement, Liquifram type pumps.

2. Output volume shall be adjustable while pumps are in operation from 0 to maximum capacity of 14 Gallons per day.

3. Adjustment shall be by readily accessible dial knobs, one for changing stroke length and the other for changing stroke frequency.

4. On-off switch shall be integral with frequency control.

5. Chemical pumps shall be capable, without a hydraulically backed diaphragm, of injecting chemicals against pressures.

6. Valves shall be cartridge type and renewable by replacing only the cartridge.

7. Pump head and fittings shall be of PVDF or CPVC construction.

8. Chemical pumps shall be LMI Model A141-352SI or approved equivalent.

C. Closed Loop Pot Feeders

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 twelve additional bags provided to owner.

D. Conductivity Controller:

1. The Controller shall be a microprocessor based, menu driven industrial type conductivity controller.

2. With relay activated on/off control outputs.

3. 0-1000 microsiemen control range with displayable a 16 character, backlit LCD display.

4. Adjustable High/Low alarm points with output relays and 4-20ma output.

5. The controller shall provide four programmable, non-concurrent operational modes for inhibitor feed using either:

a. Feed as % of bleed.

b. Feed and bleed with limit timer.

c. Percent of time.

d. Water meter triggered feed.

6. The Controller shall provide 2 two independent programmable biocide feed functions programmable in cycle modes of 1 to 4 weeks.

7. An adjustable pre-bleed function based on time or conductivity and programmable lockout feature shall be provided for each individual biocide feed.

8. Controller shall be an LMI model DC-4500111A1 or approved equivalent.

E. Corrosion Coupon Racks: One inch PVC corrosion coupon racks with isolation valves, visual 5-21 gpm flow determination, and ports for at least one mild steel and one copper coupon complete with coupons must be provided for each condense water, heating water and chilled water systems. The Sub-contractor shall provide consultation on proper installation to the mechanical contractor.

F. Provide sufficient quantity of filter bags for warranty period. Minimum of twelve additional bags provided to owner.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall be performed by the mechanical contractor with consultation by the water treatment Sub-contractor. Install where shown on the Drawings. Follow the manufacturer’s installation and start-up instructions.

B. Prior to installation of hot taps and water treatment equipment, final approval of locations and design must be given by the water treatment contractor (Chem-Aqua).

3.02 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.

6. Routine visits must be coordinated with the Owner.

7. Send copy of monthly report to Engineer for Verification.

END OF SECTION 23 25 00

SECTION 23 29 13
MOTOR STARTERS AND CONTROLLERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General Mechanical

PART 2 – PRODUCTS

2.01 MOTOR STARTERS

A. GENERAL: Provide an individual controller for each motor which does not have an integral control assembly such as a chiller and is not served from a motor control center. Certain motors require variable frequency drive controllers which are specified in Section 26 29 23.

B. ENCLOSURES: Provide NEMA 1 for standard installations and NEMA 4X for installations outdoors and wet areas including kitchen. Comply with Code requirements for other environments. Provide combination disconnect switch and starter as shown on the plans. Also, no conduit penetration on the top or on the side of any interior or exterior starter and combination starter/disconnect. All penetration shall be from the bottom.

C. AUTOMATIC STARTERS: Each starter component shall be sized in accordance with NEMA Standards, unless specifically indicated otherwise on drawings. The minimum size starter shall be #1. Each unit shall be provided with a manual reset, adjustable electronic current sensing relay that protects for over-current, unbalanced current and phase loss. Provide for auxiliary contacts, including at least one spare NO set, required for interlock wiring. Provide individual 120 volt control transformers in each enclosure sized to operate coil and equipment related control and safety devices. Provide HOA switch and red LED running light. For small motors, provide the appropriate trip unit in the Size 1 starter.

D. NAMEPLATES: Identify each device with an engraved lamacoid nameplate (5/16" high letters) showing load served. Attach with mastic and two screws.

E. FINISH: Standard except 4XSS if located outside or in the kitchen area.

F. ACCEPTABLE MANUFACTURERS: General Electric, Siemens and Square D

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

3.02 COORDINATE

A. Coordinate with approved equipment submittals prior to submitting for approval. The submittals shall indicate the equipment tag and size of motor horsepower.

3.03 CONDUIT

A. Conduit penetration into casing shall be from the bottom only. Any top and side penetrations will be rejected. Coordinate with the electrical contractor as required.

END OF SECTION 23 29 13

SECTION 23 29 23
VARIABLE SPEED MOTOR COTROLLERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General Mechanical

PART 2 – PRODUCTS

2.01 VARIABLE SPEED MOTOR CONTROLLER

A. GENERAL: Controller shall be a microprocessor controlled, adjustable frequency motor controller consisting of a sine-coded, pulse width modulated output inverter suitable for specified size and voltage motors listed on the Drawings. Unit shall be U. L. Listed as a complete package and comply with the applicable ANSI, IEEE and NEMA Standards as well as the National Electrical Code. Inverter shall be grounded and line, load, control and fire/safety wiring shall be installed in separate conduits.

B. FEATURES:

1. NEMA 1, wall mounted enclosures except provide NEMA 4 enclosures in chiller or boiler rooms. Provide combination VFD starter/disconnect as shown on the plans. Also, no conduit penetration on the top or on the side of any interior or exterior VFD starter and combination VFD starter/disconnect. All penetration shall be from the bottom.

2. Panel mounted start-stop control as well as 0-10 VDC and 4-20 ma interface to standard energy management systems.

3. Field adjustable acceleration and deceleration times.

4. 0-67 Hz controlled speed range with adjustable maximum and minimum stops.

5. Safe shutdown and immediate restart after a power outage.

6. Three contactor style, three leg manual bypass contactors with H-O-A switch and lockable disconnect. Bypass section shall be in a separate enclosure from the inverter and circuited to allow operation with all power disconnected from the inverter section. Protective controls shall operate in both normal and by-pass modes.

7. Digital keypad with LCD screen for entry of set points

8. 3% input (line) reactors and DC Bus filtered chokes matched to motor size to reduce harmonics emitted to electrical system and limit voltage spikes to motor and drive.

9. MOV’s for transient voltage protection

10. Unit shall operate normally with input up to 30% over voltage and 35% under voltage

11. Provide 115 volt control transformer to interface with vibration switches and other control devices.

12. Inherent power factor correction to .95.

C. PROTECTIVE CONTROLS (both automatic and bypass):

1. Overvoltage and undervoltage.

2. Ground fault.

3. Phase loss or failure.

D. WARRANTY: The VFD manufacturer shall provide a full parts and labor warranty for a period of three (3) years. Warranty shall begin from date of substantial completion. Provide warranty in writing to Owner and HVAC supervisor with warranty terms.

E. STARTUP: A factory trained service technician shall startup and test each drive. Technician shall contact Architect/Engineer (A/E) team prior to startup to obtain special settings that may be required for primary pumps, cooling tower and other equipment. Technician shall also operate drive through the frequency range and note any frequencies that cause resonance with the associated equipment. If directed by the engineer, lockout or skip those frequencies.

F. ACCEPTABLE MANUFACTURES: ABB.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

3.02 COORDINATE

A. Coordinate with approved equipment submittals prior to submitting for approval. The submittals shall indicate the equipment tag and size of motor horsepower.

3.03 CONDUIT

A. Conduit penetration into casing shall be from the bottom only. Any top penetrations will not be allowed. Replacement of entire VFD by contractor will be required if top penetration is made.

3.04 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.

END OF SECTION 23 29 23

SECTION 23 31 05
HVAC FABRIC DUCT SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. Non-metal ductwork as indicated on drawings and by requirements of this section.

B. Required type of non-metal ductwork for this project is a fabric air dispersion system.

1.02 QUALITY ASSURANCE AND CODE COMPLIANCE

A. QUALITY ASSURANCE:

1. Manufacturer must be a UL Registered Firm.

2. Any production facility used by manufacturer must be ISO 9001 registered.

3. Fabrics used must be produced in an environmentally friendly factory. The actual production site for each individual fabric must be Oeko-Tex certified by Oeko-Tex International - Association for the Assessment of Environmentally Friendly Textiles.

B. CODES AND STANDARDS:

1. Where fire retardant fabrics are required, products must be classified in accordance with the 25/50 smoke/flame spread development requirements of UL723 -"Standard for Test for Surface Burning Characteristics of Building Materials" as required by UL2518 - "Outline of Investigation for Air Dispersion System Materials".

2. If antimicrobial treated duct is specified, product must be treated with an EPA approved and listed antimicrobial agent.

1.03 SUBMITTALS

A. Submit copy of UL/ULC Registered Firm certificate and ISO 9001 certificate from production facility.

B. Submit UL file number under which product is Classified by Underwriter's Laboratories to UL2518 (as required by NFPA 90A) or ULC-S102.2 for Canada.

C. If Antimicrobial treated duct is specified, submit documentation for EPA registration.

D. Submit manufacturer's drawings indicating size and placement of dispersion units, and installation instructions.

E. Submit manufacturer's technical product data for fabric dispersion units.

F. Submit manufacturer's performance data for each fabric duct system including airflow rate, design static pressure, inlet velocity, and isothermal throw.

G. Submit manufacturer's maintenance data.

1.04 WARRANTY

A. Manufacturer shall provide a 10 year non-prorated warranty, unless otherwise mentioned in sections 2.2.A.a, 2.2.B.a, etc., below. Prorated warranties will not be accepted.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect FabricAir® systems from damage during shipping, storage, and handling.

B. Product shall be protected from the elements at all times.

PART 2 – PRODUCTS

2.01 MANUFACTURER AND MANUFACTURER'S REPRESENTATIVE

A. Listed manufacturers must comply with all previous described requirements.

B. FabricAir, Inc. (basis of design)

C. 312-A Swanson Drive

D. Lawrenceville, GA 30043

E. Phone: (502)-493-2210

F. Fax: (502) 493 4002

G. E-mail: sales-US@fabricair.com

H. Equal by Ductsox, KE Fibertec, and Prihoda is acceptable.

2.02 FABRIC AIR DISPERSION SYSTEM.

A. Round fabric air dispersion system shall be constructed of FabricAir® Combi 70 fabric. The fabric is a woven fire retardant and permeable fabric complying with the following characteristics:

1. Duct Shape: Round
2. Fabric: 100% Flame Retardant Polyester
3. Weight: 8.50 oz./yd² per ASTM D3776
4. Shrinkage: Max. 0.5% per EN ISO 5077
5. Color: STANDARD
6. Temperature Range: -40°F and +284°F

7. Base Permeability @ 0.5" WG: 2 CFM/SQFT per ASTM D737, Shall be verified by the Frazier Permeability Test

8. Fire Retardancy: Shall meet the requirements of NFPA 90-A, ICC AC167 and UL 2518

9. Manufacturer shall provide a 10 year non-prorated warranty. Prorated warranties will not be accepted.

B. SYSTEM FABRICATION REQUIREMENTS

1. The system is made with sewn in, but still removable, aluminum hoops. The rods support the shape of the fabric system by 180° (8”-48”), 120° (49”-60”), 90° (61”-68”) and 60° (69”-80”). Hoops must be pre-installed from factory, no installation at sight. Diameter of hoops and distance between as specified by manufacturer.

2. Elbows of 70° or more to have 2 hoops sewn in order to maintain shape.

3. Air dispersion shall be accomplished with JetFlow® diffusers. Jet diameter shall be between 2" and 10". Jet height shall be a minimum of 1½". Jets shall have a discharge coefficient of 90% or better. Jets shall be supplied with a separate zip-in plug. Due to exact throw requirements and NC requirements alternative flow models are not acceptable.

4. Jet color shall match fabric color unless otherwise noted on drawings.

5. Number, spacing, and size of jets shall be determined by the manufacturer.

6. Fabric system shall include connectors to attach to suspension system listed below.

7. Provide system in sections optimized for maintenance, connected by zippers. Zippers shall provide closure completely around the circumference to prevent leakage. Required number of zippers shall be specified by the manufacturer.

8. Each section to have a unique tag including information about manufacturers order number, position, diameter of section, length of section, maintenance instruction, code compliance and contact details for spare parts.

C. DESIGN PARAMETERS

1. Use fabric air diffusers only for positive pressure air distribution.

2. Do not use fabric air diffusers in concealed locations.

3. Fabric diffusers shall be designed to a maximum of 3" water gauge, with 0.5" being the standard.

4. Design temperatures shall be between -40°F and +284°F

5. Manufacturer shall approve all technical design parameters.

D. HANGERS AND SUPPORTS

1. Type 1: Type 8: One row H-rail/cable system located 2" above 12 o'clock of FabricAir® system. Hardware to include H-rail joint, eye bolt, end cap H-rail, cable, tie down strap and H-rail as required. FabricAir® system shall be attached to hardware using one single row of plastic sliders located 12 o'clock spaced 20 inches.

2. Hardware: Anodized Aluminum H-Rails - With PVC coated Galvanized Steel suspension cable. Suspension cable clamps, H-rail suspension eyebolts, and all other factory supplied metal components shall be Galvanized Steel.

2.03 AIR HANDLER REQUIREMENTS

A. Provide adequate pre-filtering prior to the fabric duct system, all according to manufacturer's specifications.

B. Air handler filters shall be changed per unit manufacturer's requirements. Failure to maintain clean filters may result in a voided warranty.

C. Provide fans capable of delivering the specified air volume at the specified static pressure.

PART 3 – INSTALLATION

3.01 INSTALLATION OF FABRICAIR® SYSTEM

A. Examine area and conditions under which the FabricAir® systems are to be installed. Do not continue any installation until unsatisfactory conditions have been corrected.

B. Install chosen suspension system in accordance with the requirements of the manufacturer. Installation instructions shall be provided by the manufacturer with product.

C. Coordinate layout with suspended ceiling, lighting layouts, and all other trades that may interfere with the installation of FabricAir® systems.

3.02 CLEANING

A. Clean air handling unit and other ductwork prior to the FabricAir® system as it is installed. Ensure that all construction debris, including dust, is removed from the air handling unit and other ductwork before connecting the FabricAir® system.

B. If the FabricAir® system becomes soiled during the installation, it should be removed and cleaned following the manufacturers cleaning instructions.

END OF SECTION 23 31 05

SECTION 23 31 13
HVAC METAL DUCTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. Low-Emitting Materials: All interior adhesives and sealants shall meet VOC limit requirements to achieve these points.

C. Made in USA Standard: All sheet metal shall be made in the USA.

PART 2 – MATERIALS AND METHODS

2.01 LOW PRESSURE DUCTWORK

A. Furnish and install all supply, return, exhaust, outside air and other ductwork shown, together with splitters, extractors, dampers, etc. All ductwork, supports, bracing, etc. shall be constructed of new grade, lock forming quality, G-60 or better galvanized steel sheets.

B. Dimensions of duct work shown on Drawings are inside air stream dimensions. Allowances have not been made for duct insulation.

C. Provide balancing OBD in each zone duct of multi-zone AHU's. Provide adjustable extractors with quadrant lock mechanism equal to Titus AG-45 at all supply outlet taps into trunk duct. Provide conical tap with damper and raised quadrant lock for flexible duct taps, reference detail on the Drawings. Provide adjustable round elbows (0-90□) at ceiling devices connected with flex ducts (not required if Flexmaster self supporting flex or Thermaflex Flexflow Elbow is used).

D. Ductwork shall conform with ASHRAE, the current edition of SMACNA "Duct Manual and Sheet Metal Construction for Ventilating and Air Conditioning System" and the National Board of Fire Underwriters Pamphlet 90A, plus more stringent requirements of these Specifications. Adjust location of standing seams to clear structural members.

E. Duct connections to air handling units and fans shall match the outlet/inlet size, or as recommended by the equipment manufacture, including straight lengths of duct before transitions, to minimize system effect losses. Where duct adapters or damper trays are provided with roof fans, duct connections shall match size for a minimum of 36” before elbow or transition.

F. All duct transitions shall be gradual with a 15° maximum angle as measured from centerline of duct. This includes angled offset, mitered offset, eccentric transition and concentric transition (2 x 15°).

G. Ductwork shall be constructed to operate at the pressure as specified under "external static pressure" of the associated air handling unit and fan schedule. Ductwork downstream of VAV boxes and fan coil unit shall be 1” static class ductwork. Ductwork operating at .75 to 2.0” shall be 2.0” pressure rated. Primary ductwork from a variable air volume air handling unit shall be

constructed in accordance with Section 2.2 Medium Pressure Ductwork.

H. Square turns shall be equipped with airfoil turning vanes built to SMACNA Standards. Provide radius turns for elbows less than 90°.

I. Support ductwork with 1" wide x 20 gage galvanized steel straps; 6'-0" maximum centers but not more than allowed by SMACNA. Connect strap to duct with two sheet metal screws on each side of duct and one on bottom. Exposed ducts shall be supported in a manner to provide a finished appearance.

J. Install duct braces in duct openings to hold shape of duct until grilles, registers and/or diffusers are installed. Then remove duct brace.

K. Seal all duct joints, adjustable elbows, spin-in taps and any penetrations of the duct such as screws with Foster 32-19, Childers CP-146, Design Polymerics DP1010 or Hardcast IG601 Iron Grip installed full strength (no dilution). Ductwork subject to moisture (indoors) and not required to be welded, shall be sealed with Foster 32-14 or Childers CP-140.

L. In areas noted to have round double wall ductwork, provide United McGill Acousti-K27. Outer duct shall be constructed of paintable, 18 gauge galvanized steel. Inner duct shall be perforated galvanized steel. Between the inner and outer ducts install 2” thick fiberglass insulation coated to inhibit growth of micro-biological organisms and to eliminate erosion of fibers.

M. The minimum distance between the VAV/CVT box and the first tap shall be 54”. The minimum distance between taps on the same side of the duct shall be 54”.

N. Provide equivalent sized duct of different aspect ration to accommodate ceiling cavity conditions.

O. Sheet metal contractor shall install control system devices that are attached to ductwork. This includes control dampers and sensors.

P. All ductwork sheet metal shall be made in the United States of America.

Q. Provide access doors for cleaning ductwork before and after coils, filters, fans and dampers. Locate doors so that the minimum numbers possible are used.

R. Provide removable end caps on ducts.

S. Acceptable Manufacturers

1. Flexmaster
2. Hart & Cooley
3. Peppertree Air

2.02 MEDIUM PRESSURE DUCTWORK

A. Furnish and install medium pressure round and oval ducts as indicated on the Drawings, connecting air handling units to fan powered boxes. All ducts shall be sized as indicated on the Drawings, and properly supported and hung from the building structure by trapeze hangers. The minimum size hanger rod shall be 3/8”. Completed duct system (taps and access panels

installed) shall be tested at 5” water column at which pressure leakage shall not exceed 3/4 of 1% of the total designed CFM for the individual duct system being tested prior to being insulated. Test shall be witnessed by Engineer and Owner. Provide a 7 days’ notice of scheduled test and a report of all the tests.

B. Medium pressure round or oval duct shall be spiral lock seam duct as manufactured by Gowco, Graco or United Sheet Metal with matching factory-made fittings and couplings. All transitions shall be gradual with 15° maximum angle with centerline of the duct. All joints and fittings shall be spot-welded and sealed.

C. Gauges of round medium pressure ducts shall be as follows:

3” thru 8”	26 gauge
9” thru 22”	24 gauge
24” thru 36”	22 gauge
38” thru 50”	20 gauge
52” thru 60”	18 gauge

D. Gauges of flat oval spiral ducts shall be 22 gauge up to 48” major axis and 20 gauge from 49” thru 74” major axis. Fittings shall be 20 gauge up to 36” major axis, 18 gauge for 37” thru 50” and 16 gauge for 51” and larger major axis. Centerline radius of elbows shall be 1½ duct diameters. Provide conical take-off’s where possible.

E. Fittings and couplings thru 36” shall be 22 gauge, 38” thru 60” shall be 20 gauge.

F. All square to round/oval transitions at air handling unit discharges shall be 18 gauge galvanized steel with all welded connections, and shall have flanged rectangular connection.

G. All turning vanes shall be heavy gage, double thickness type.

H. All ductwork shall be externally insulated per the Specifications.

I. All joints in ducts and fittings shall be sealed with United Sheet Metal High Pressure Unigrip duct sealer, Childers CP-140 or Foster No. 32-14.

J. Connections to fan powered boxes from main duct to box extension shall be made with a two foot length of straight flexible connecting duct. This flexible duct shall be Atco 36 flexible duct. Provide a hard, straight section of round duct at VAV box connections with length 1½ times duct diameter. Connect inner liner to spin-in, VAV box, round rigid duct or air device with ***nylon wire tie strap. Secure outer cover with another nylon wire tie strap.***

K. Ductwork supports shall consist of unistrut with 3/8” thick or heavier all thread rods attached to structure. Provide double nuts and cut all tread so no more than 1” extends beyond nut.

L. Provide Nailor Industries Model 0800-M1 insulated access panels with camlocks and safety chain. Provide 18” x 10” size approximately 20 feet on center.

2.03 KITCHEN HOOD EXHAUST DUCTWORK

A. GENERAL: Make connections to all hoods and extend ductwork to exhaust blowers. Securely fasten and support ducts at every change of direction. Supports or fasteners shall not penetrate

any duct or plenum. Systems shall be installed to maintain not less than 1500 feet per minute velocity. Discharge air outlets shall be at least 40" above roof and at least 24" above any intake opening with 10 feet.

B. DUCT CONSTRUCTION: Install ductwork without forming dips or traps and slope not less than 1" per foot downward toward hood. Provide cleanout openings at each change in direction. Cleanout openings shall be equipped with tight fitting doors, same thickness as duct, equipped with latching to make grease tight. Doors shall be operable and removable without the use of a tool.

C. COOKING HOOD EXHAUST DUCT: Black steel, minimum 16 gage, with grease tight, continuous external welded joints.

2.04 DUCTWORK FOR OUTSIDE AIR HOODS AND FANS

A. Where hoods or fans are shown open to mechanical room, shop, etc., provide short length of duct to allow installation of OBD and/or motorized control damper. Duct dimension shall be roof curb opening size or larger if required by damper size.

2.05 PLENUMS AND BLANK-OFF PLATES

A. Provide plenums at louvers, air handling units, fan coil units and other equipment where return air or outside air ducts are shown to connect. Provide plenums for the mounting fans to louvers. Provide full or partial blank-off plates on return air openings as necessary for properly balancing of system supply air, outside air and return air flows or to cover openings where air transfer is not desired.

B. Construct plenums with galvanized steel framing members and galvanized sheet steel, cross broken or rigidly braced with galvanized angles. Gages and bracing shall conform to SMACNA recommendations for ductwork of like size. Openings for fans, access doors, etc., shall be framed with galvanized steel angles.

C. Where access doors are shown, provide hinged doors with #202 Ventlok latch.

2.06 DRYER EXHAUST DUCTWORK

A. Snap lock, round galvanized sheetmetal with taped, slip-fit joints. Minimum 26 gage. Eliminate edges and sheetmetal screws that could catch lint. Use duct tape or pop-rivets on all seams and joints.

B. Install flexible connections of fire-resistant material with spiral inner liner wire, stainless steel clamps between unit and exhaust duct.

C. Roof discharge cap shall have baffled outlet, without bird screen similar to Penn Pul-Air.

2.07 SCREENS

A. Furnish and install screen on all duct, fan, etc., openings which lead to or are outdoors. Screens shall be No. 16 gage, galvanized steel 1/2" mesh bolted into removable galvanized steel frame.

Install screens over return air openings between floors.

2.08 METAL CLOSURES

A. Provide metal closures around all openings in floors or walls through which ducts or piping are passing.

B. Build 3" high by 3" wide concrete "dam" around duct or return air penetrations of mechanical room floors above grade. Floor return air openings without sound attenuator attached shall be covered with 1" x 1/8" welded steel bar grating supported by 2" x 2" x 1/4" angles attached to slab with 3/4" round drilled anchors, 24" on center.

C. MATERIALS:

1. Where no fire rating required, and where no fire dampers installed: 18 gage galvanized sheet metal.

2. Where fire rating required or where fire damper is installed: Gage of sleeves shall be as required by the conditions of U. L. listing, but not less than the gage of duct. Minimum 18 gage. Install 1½" x 1½" x 1/8" angles around duct on both sides of wall or floor penetration.

3. Sleeves for floor pipe penetrations above grade shall be a section of Schedule 40 steel pipe extending 3" above finished floor and sealed watertight.

2.09 SADDLES

A. Provide sheet metal protective saddles at all pipe supports for insulated piping. Saddles shall be strapped / banded so that do not move or slide. Refer to Insulation Section.

2.10 DRAIN PANS

A. GENERAL: Provide drain pan under fan coil units, air handling units, water heaters and other equipment subject to water leakage not mounted on concrete floor in mechanical room. Route drain line to approved location.

B. CONSTRUCTION: 16 gauge galvanized steel suitably stiffened, with minimum 2" perimeter lip and all joints soldered watertight. Provide ¾'' nipple connection and overflow drain to suitable location.

2.11 RETURN AIR BOOTS

A. Provide sheetmetal return air boots with 90° elbow with no turning vanes where noted and detailed on the drawings. Boots shall be lined with 1" liner for sound absorption as specified in Section 23 03 13.

PART 3 – INSTALLATION

3.01 SHEET METAL SHOP DRAWINGS

A. Prior to fabrication of any sheet metal, submit Shop Drawings for all ductwork, showing coordination of mechanical, electrical, plumbing and structural components. All crafts shall sign off on final drawings. The shop drawing shall include a construction details booklet (multiple copies), one blueline set of drawings and one reproducible set of drawings. The booklets and reproducible set with comments noted will be returned. Contractor shall provide blueline sets of drawings from the reproducible set for distribution to Owner, Architect and others.

3.02 INSTALLATION OF DUCTWORK AND AIR DEVICES

A. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where fabrication and installation of the work of this section may properly commence.

B. Verify the location of all ducts, structure, piping and equipment. Coordinate the routing of all work with that of other trades prior to installation. Verify that all ductwork will fit spaces indicated prior to fabrication or installation of any ductwork.

C. Exact location of all registers, grilles or ceiling outlets shall be verified by the Architect before roughing-in. Reference shall be made to reflected ceiling plan in locating ceiling outlets.

D. Ducts shall be installed in a neat and workmanlike manner.

E. Building must be dried in before installing ductworks. Ductwork exposed to the element shall be wrapped with plastic to protect from dust and moisture. Ductwork shall be wiped down prior to being insulated.

3.03 CONNECTIONS TO LOUVERS

A. All connections to louvers shall be in a manner that will be watertight. Ductwork behind louver for a minimum of three feet shall have watertight soldered joints and shall be sloped to weep holes in bottom of louver. Duct shall be lapped over bottom louver blade where possible. Make connections to aluminum louvers with dielectric connections.

3.04 ADJUSTMENTS AND CORRECTIONS

A. Balance all systems of ductwork including exhaust systems to obtain the air quantities indicated for each inlet and outlet. Air quantities shall be further adjusted as required to obtain uniform temperatures in the spaces.

END OF SECTION 23 31 13

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

PART 2 – PRODUCTS

2.01 DAMPERS

A. GENERAL: Provide dampers where shown on Drawings and wherever necessary for complete control of air flow, including all supply and outside air ducts. Provide multi-blade volume dampers in all zone ducts at multi-zone air handling units. Where access to dampers through a suspended ceiling is necessary, coordinate the proper location of the access doors. Install, mount and connect into ductwork all control dampers furnished under the control contractors' supervision.

B. SPLITTER DAMPERS: Shall be constructed of single thickness, 16 gauge galvanized steel, hinged at leaving edge and founded at entering edge, securely riveted or welded to a square operating rod. The length of the splitter damper blade shall be 1½ times the width of the split in the main duct, but not less than 12".

C. VOLUME DAMPERS: Factory constructed of 16 gage galvanized steel for frame and blades. Blades shall not exceed 48" in length or 6" in width, and shall be of the opposed interlocking type. The blades shall be supported on 1/2" diameter rust-proofed axles. Axle bearings shall be self-lubricating ferrule type.

D. BAROMETRIC RELIEF DAMPERS: Factory constructed of galvanized steel for frame and aluminum blades. Provide counterbalance weights for fine tuning start-to-open and full open operations. Start-Open pressure is 0.05" WG and maximum back pressure is 2" WG. Greenheck Model BR-30 or equivalence.

E. FLEX TAP CONNECTIONS: Taps on rectangular low-pressure ducts for flexible connections to diffusers, etc shall be 22 gauge, round conical taps with adjustable single blade damper. Damper rod shall be continuous though tap with blade mechanically attached. Provide bearings at each end, and quadrant lock operator with wingnut and 2" standoff bracket for insulation. Refer to detail on the drawings for additional construction details.

F. DAMPER ADJUSTING DEVICES: Each splitter or volume damper shall be fitted with an adjusting device extending beyond external duct insulation.

1. ACCESSIBLE CEILINGS: Ventlok #641 regulators attached directly to duct and location marked in ceiling as approved.

2. NON-ACCESSIBLE CEILING: Regulators exposed. Ventlok #666 rods and #607 end bearings.

2.02 FIRE DAMPERS

A. Install fire dampers in all duct penetrations and return air openings in fire rated walls, ceilings, floors and chases. Provide fire damper at each sidewall register or grille. Provide additional fire dampers where specified by local building codes and also where shown on drawings.

B. Construction shall conform to requirements of NFPA Pamphlet No. 90A with recommended steel sleeves, fusible links, spring catches, non-corrosive bearings, etc., and shall be U. L. labeled.

C. Fire dampers shall be shutter type providing minimum restriction to air flow. Provide Type B for ducts passing through walls. Provide thinline Type A dampers at sidewall registers. Provide Type B (or Type A of equal free area) dampers at wall openings. Select damper thickness to fit within the thickness of the wall with OBD's or other specified devices. Dampers located in medium pressure ducts shall be compatible with this construction including the specified maximum leakage rate. Install dampers in accordance with conditions of their U. L. listing.

D. Air devices in U. L. fire rated ceilings shall have compatible U. L. classified ceiling dampers with volume adjustment mechanism and extension collar equal to Ruskin CFD-A. Install complete system including thermal blanket on back of air device in accordance with the U. L. listing.

E. Acceptable Manufacturers: Air Balance Inc, Greenheck, Nailor, Pottoroff, Price, Ruskin and Safe-Air

2.03 SMOKE DAMPERS

A. Dampers shall be 1½ hour fire rated under U. L. Standard 555S. Dampers shall be normally closed with a leakage rate of no more than 10 CFM per square foot at 1" static pressure (Class II). Provide duct sleeve. Damper blades shall be airfoil type for low pressure drop and low noise when in the open position.

B. Damper operator shall respond to remote signals to open and close, and shall fail in the closed position. Damper operator shall be 120 volts unless noted otherwise. Provide micro-switches to signal full open and full closed positions.

C. Dampers noted to be combination smoke and fire shall have fusible link assembly to close damper on elevated temperature.

D. Smoke dampers shall be Nailor Model 1211. Combination dampers shall be Nailor Model 1221.

E. Acceptable Manufacturers: Air Balance Inc, Greenheck, Nailor, Pottoroff, Price, Ruskin and Safe-Air.

2.04 ACCESS DOORS TO FIRE AND SMOKE DAMPERS

A. Provide double wall galvanized steel, insulated access door in duct for inspection and service to fire damper and fusible link. Minimum size shall be 16"x16" with four cam latches unless limited

by duct size. Access doors in stainless steel ducts shall be constructed of stainless steel.

B. Construct access door airtight and conform to recommendations of NFPA and SMACNA.

C. Opening of access panel shall be within 12” of the damper to allow resetting of the actuator.

D. Access door to damper install in middle pressure duct systems shall be similar to that in specifications 23 31 13, paragraph 2.2J.

2.05 FLEXIBLE DUCT

A. Flexible duct shall be U. L. Listed 181 Class I air duct with fiberglass/aluminum foil inner liner, fiberglass insulation with a C=.23, bi-directional reinforced metalized vapor barrier outer jacket and 6" w.c. pressure rating. The insulating value shall be meet the International Energy Code, minimum R=6. The maximum length between duct and air device shall be six feet. The maximum length between duct and single or double duct mixing box shall be three feet. Flexmaster Type 3M or Thermaflex M-KE. Connect inner liner to duct tap, VAV box, round rigid duct or air device with stainless steel, adjustable bands (hose clamps). Secure outer cover with nylon wire tie strap. Tape edges of outer cover to adjacent insulation or duct with FSK foil tape to present a finished appearance. Provide adjustable round elbows (0-90°) at ceiling devices connected with flex ducts (not required if Flexmaster self supporting flex or Thermaflex Flexflow Elbow is used).

2.06 DUCTSOX FABRIC AIR DISTRIBUTION SYSTEM

A. Provide DuctSox air distribution as shown on the Drawings. DuctSox shall be standard round shape with high-throw air distribution system with internal flow control devices to ensure proper distribution for this application. Provide metal to fabric adapter, and fabric elbows, tees and offsets to form the duct layout shown. Fabric shall be air permeable, Sedona-Xm FR polyester twill with anti-microbial treatment. Standard color selected by Architect. Provide the “all-in-one” support system to keep duct somewhat round when system is off. Manufacturer shall provide computer analysis of their proposed duct system showing proper air distribution for the specific application on this project. Equivalent product by Fabric Air, Prihoda and KE Fibertec are acceptable.

2.07 FLEXIBLE CONNECTIONS BETWEEN AHU, VAV BOX OR FAN AND DUCTWORK

A. Flexible connections shall be made from neoprene coated, woven glass fiber material, 30 ounce per square yard, installed air tight with at least 1" slack to ensure that no vibration is transmitted from fan to ductwork. Air handling units with fans that are internally isolated from the housing do not require flexible connections.

2.08 SOUND ATTENUATORS

1. GENERAL: Basis of specification is the United McGill Type UTLER. Unit shall consist of 22 gage, galvanized steel outer shell with 24 gage galvanized steel, die stamped internal passages. Acoustical filler shall be fiberglass compressed to 4.5 pcf density enclosed in an erosion resistant polymer bag.

2. ATTENUATION: Sound attenuation shall be within 5% of that listed below at 1000 FPM face velocity:

Octave Band	2	3	4	5	6	7	8
36" long insertion loss, dB	4	5	7	12	14	14	11
60" long insertion loss, dB	8	8	12	20	22	21	16
84" long insertion loss, dB	11	15	21	30	32	27	19

3. PRESSURE DROP: Silencer design must limit pressure drop to .1" w.g. based on 1000 feet per minute face velocity.

4. INSTALLATION: Attenuators shall be installed in galvanized sheet metal wall sleeve and sealed with duct sealant to prevent air leakage.

5. ACCEPTABLE MANUFACTURERS: AeroSonics, Anemostat, Buensod, Commercial Acoustics, IAC, Koppers, Rink, Pottorff, Price, Ruskin, Dynasonics, Transonic Industries, United McGill and Vibro-Acoustics.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

END OF SECTION 23 33 00

SECTION 23 34 16
HVAC FANS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

PART 2 – PRODUCTS

2.01 ROOF FANS AND VENTS

A. GENERAL: Furnish and install as indicated and scheduled on the plans. Capacities and sizes shown are the minimum required. Fans shall bear the AMCA seal of certified ratings for air and sound performance. Fans and their accessories shall be a prewired assembly from the factory for single point connection by the electrical subcontractor. Fans for fume hoods and prep rooms shall have acid resistant coating and explosion-proof construction, see Plan Schedule.

B. DESIGN: Fans shall be low silhouette type with removable top for easy access. Housings shall be constructed of heavy gauge aluminum. Kitchen fans shall have grease trough, discharge air vertically from a minimum of 40 inches above roof and be mounted on 18" high curb per NFPA 96, and shall be U. L. 762 Listed up to 400°F. Power assemblies shall be completely removable as a unit for ease of service.

C. DRIVE: Provide direct-drive with ECM for 120V fans. All 480V fans to have belt drive with heavy cast iron sheaves, adjustable drive sheave and adjustable motor plate. Centrifugal fans shall have motor out of the air stream, cooled by outside air.

D. FAN: Centrifugal fans shall have aluminum, backward curved, non-overloading wheel. Propeller fans shall be of heavy aluminum construction with a minimum of five blades set in a smooth venturi orifice.

E. ROOF CURBS: Mount on insulated, welded prefabricated aluminum roof curb (galvanized steel if on steel decking) with integral cant strip. Curbs shall be designed to mount fan level on sloped roof and be compatible with roof construction specified under the Architectural Sections of the Specifications. Provide duct adapter matched to supply air fans selected. Securely attach fans and hoods to curb with two bolts on each side. Bolt curb to structure.

F. KITCHEN HOOD FANS: Fans shown to have both a supply and exhaust fan mounted on a common curb shall have separate electrical connections and associated disconnect switches for each fan. Starters will be remote mounted and are not a part of the fan assembly. Outside air intake duct shall be sufficiently long to provide 10 feet separation between exhaust and intake even if installed perpendicular to rather than inline with the fan curb.

G. ACCESSORIES: All fans shall have built-in thermal overloads, disconnect switch and bird screen. Backdraft dampers shall be aluminum construction with nylon bushings. Provide additional accessories as noted on the Drawings.

H. HOODS: Provide roof intakes and relief hoods of similar construction, features and installation as fans.

I. ACCEPTABLE MANUFACTURERS: Cook, Greenheck, Penn-Barry, and Twin City.

2.02 MISCELLANEOUS FANS

A. GENERAL: All fans shall be AMCA rated for air and sound. Each fan shall have fan blade and drive guards, disconnect switch and mounting isolators where applicable. Belt drive fans shall have adjustable motor base plates and adjustable cast iron drives sized for 150% of motor horsepower. Dampers shall be aluminum construction with stainless steel shafts and Teflon bushings. Fans and their accessories shall be a prewired assembly from the factory for single point connection by the electrical subcontractor.

B. ACCEPTABLE MANUFACTURERS: Cook, Greenheck, Penn-Barry, and Twin City.

2.03 MOTORS

A. Refer to Section 23 05 13 for motor requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

END OF SECTION 23 34 16

SECTION 23 36 00
AIR TERMINAL UNITS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

PART 2 – PRODUCTS

2.01 AIR TERMINAL UNITS

A. Mixing box shall be pressure independent with up to 5” of inlet static pressure, single input box with built-in sound attenuator and constant volume fan. Fan shall operate at greater than 760 RPM. Box shall have bottom access panel.

B. Air terminal unit shall have DDC controller supplied by the temperature controls contractor and mounted by the box manufacturer at its factory. Box supplier shall include cost of controller mounting in his bid.

C. Air terminal unit shall include ultra-high efficiency ECM motor and associated factory installed/set automatic adjusting controller with manual setpoint adjustment, recirculated air filter, electronic damper actuator, multi-point center averaging type velocity sensor, fan contactor, disconnect switch and minimum 50 VA 277V/24V control transformer (120V/24V if box is 120V). Inlet air sensor chamber shall contain straightening vanes or be of required length to obtain accurate readings.

D. Boxes shall have the scheduled air flow at a maximum of .3" static pressure differential and an NC rating of 30 or less. Sound performance ratings shall be ARI certified.

E. The assembly casing shall be constructed of 22 gage galvanized steel, internally lined with 3/4” closed cell, cleanable insulation. Hot water heating coil shall be minimum two row, copper tube, aluminum fin construction.

F. Damper blades shall have a maximum leakage of 2% at 3" static pressure. Units shall have normally open dampers shipped in the full open position.

G. Since the various brands of VAV boxes vary widely in size and shape, acceptable manufacturers who are not the brand specified on the Drawings shall ensure that their equipment will fit the available space prior to submitting a bid to the contractor.

H. Provide (1) spare motor for each size and type of air terminal unit. Spare motor to be provided to owner for attic stock.

I. ACCEPTABLE MANUFACTURERS: Krueger, Metalaire, Price, and Titus.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

3.02 FIELD QUALITY CONTROL

A. The following field quality control shall be provided

1. Check electrical for proper voltage.
2. Test operation of unit
3. Provide test report.

3.03 THE FOLLOWING STARTUP SERVICE

A. The following startup service shall be provided

1. Verify controls installed
2. Verify cold/hot duct connection
3. Verify coil inlet/outlet connection
4. Verify nameplate / ID tag
5. Provide startup report.

END OF SECTION 23 36 00

SECTION 23 37 13
DIFFUSERS REGISTERS AND GRILLES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General Mechanical

PART 2 – PRODUCTS

2.01 AIR DEVICES

A. Furnish and install louvers, supply, return and exhaust registers, grilles and outlets shown on the Drawings.

B. All devices shall be all aluminum construction and shall have white finish. Aluminized type corrosion resistant steel with finish having a five-year warranty against the formation of visible rust will also be acceptable. Devices in U. L. fire rated ceilings shall be of aluminized steel construction with white finish, suitable for U. L. classification.

C. All supply outlets shall be equipped with opposed blade volume dampers. Provide Titus Model D-75 for supply diffusers.

D. The air distribution equipment supplier shall guarantee that each supply, return and exhaust device shall be of the proper design and size to pass the indicated quantity of air into or out of the space involved, with maximum diffusion and without objectionable noise, excessive friction or objectionable air movement at the occupied level.

E. Registers, grilles and outlets shall be of manufacture, type and capacity as shown on the schedule of the Drawings. Similar devices of other manufacture may be submitted for approval for those items for which a reasonably close substitute is available. Devices must be similar in appearance and their style must be acceptable to the Architect.

F. If devices other than those shown are proposed, the values for their face velocities, neck velocities and noise levels, DBA or NC, shall not exceed these values for the devices scheduled on the Drawings.

G. Ceiling outlets shall be of a type compatible with the ceiling in which they are installed and shall have removable core with overlapping cone design to prevent vertical downward projection of air.

H. Contractor shall check the Architectural Drawings and verify the type of ceiling shown in the various areas to determine the proper type of outlet for the ceiling used.

I. Air devices in U. L. fire rated ceilings shall have compatible U. L. classified ceiling dampers with volume adjustment mechanism and have U. L. approved fireproofing on device. Dampers connected to flexible ducts shall also have extension collar feature equal to Ruskin CFD-A. Sidewall registers shall have thinline fire damper. Fire proofing devices shall contain no friable or fibrous material in the air stream.

J. Air diffusers not required to have fireproofing on the back of the diffuser shall be factory insulated suitable for return air plenum installation.

K. ACCEPTABLE MANUFACTURERS: Krueger, Metalaire, Price and Titus.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

END OF SECTION 23 37 13

SECTION 23 41 00
HVAC AIR FILTERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

PART 2 – PRODUCTS

2.01 AIR FILTERS

A. GENERAL: Provide complete sets of air filters for all supply air handling equipment for use during construction. Protect filters during construction with an overlay of polyester filter media. Replace overlay filter media and filters during construction as necessary to protect coils. Install a set of new filters prior to Testing and Balancing of the system. Install a final set of new filters after Substantial Completion and provide a new full set of filters for the District's use during the warranty period.

B. FILTER MEDIA: Astro Pleat MERV 13 (by Air Filters Inc.) minimum efficiency, pleated, disposable type filter, 2" thick, suitable for face velocity up to 350 FPM with initial resistance not more than .17" w.g. at that velocity. Use .5" w.g. resistance in fan motor selection.

C. For unit requiring custom filter rack, contact manufacturer Joe W. Fly Company Inc.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

END OF SECTION 23 41 00

SECTION 23 52 00
BOILER SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

A. This section includes gas-fired, condensing cast-iron boilers and copper finned tube boilers for hydronic heating.

B. Related Sections include the following:

1. Section 23 09 23 for control wiring for automatic temperature control.

1.03 SUBMITTALS

A. PRODUCT DATA: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories (including flue vent) for each model indicated.

B. SHOP DRAWINGS: Detail equipment assemblies and indicate dimensions, required clearances, and method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-Installed wiring.

C. SOURCE QUALITY CONTROL TESTS AND INSPECTION REPORTS: Indicate and interpret test results for compliance with performance requirements before shipping.

D. FIELD TEST REPORTS: Indicate and interpret test results for compliance with performance requirements.

E. MAINTENANCE DATA: Include in the maintenance manuals specified in Division 1. Include parts list, maintenance guide, and wiring diagrams for each boiler.

F. Refer to Section 23 00 00 for additional shop drawing requirements.

1.04 QUALITY ASSURANCE

A. LISTING AND LABELING: Provide electrically operated components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. ASME COMPLIANCE: Boilers shall bear ASME "H" stamp and be National-Board listed.

C. FM COMPLIANCE: Control devices and control sequences according to requirements of FM.

D. IRI COMPLIANCE: Control devices and control sequences according to requirements of IRI.

E. Comply with NFPA 70 for electrical components and installation.

F. CSD-1

G. SCAQMD Rule 1146.2 for low NOx equipment.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 "Cast-in-Place Concrete".

1.06 WARRANTY

A. GENERAL WARRANTY: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. The boiler manufacturer shall warrant each boiler, including boiler, trim, boiler control system, and all related components, accessories, and appurtenances against defects in workmanship and material for a period of eighteen (18) months from date of substantial completion. Heat exchanger and fuel burner shall be warranted for a period of five (5) years from date of substantial completion.

B. SPECIALTY WARRANTY: Submit a written warranty, executed by the contractor for the heat exchanger.

1. Warranty Period: Manufacturer's standard, but not less than 10 years from date of Substantial Completion on the heat exchanger. Warranty shall be non-prorated and not limited to thermal shock. Additional 21-year thermal shock warranty on heat exchanger.

C. Warranty work shall not be performed by installing mechanical contractor.

PART 2 – PRODUCTS (CONDENSING BOILER)

2.01 MANUFACTURERS

A. AVAILABLE MANUFACTURERS: Manufacturer shall be a company specializing in manufacturing the products specified in this section with minimum five (5) years experience. Subject to compliance with requirements, manufacturers offering boilers that may be incorporated into the Work include, but not limited to, the following:

B. DESIGN: Boilers shall be CSA design certified as a condensing boiler. Boilers shall be designed for a minimum of 5:1 continuous turn down with constant CO2 over the turndown range. The boiler shall operate with natural gas or propane and have a CSA certified input rating as noted on the drawings, and a thermal efficiency rating of at least 96%. The boiler shall be symmetrically

air-fuel coupled such that changes in combustion air flow or flue flows affect the BTUH input without affecting combustion quality. The boiler will automatically adjust input for altitude and temperature induced changes in air density. The boiler will use a proven pilot interrupted spark ignition system. Hot surface ignition will not be accepted. The boiler shall use a UL approved flame safeguard ignition control system using UV detection flame sensing. The UV detector shall be air cooled to prevent condensate formation and so designed as to prevent misalignment. The design shall provide for silent burner ignition and operation. The boiler shall be down fired counter flow or horizontal flow such that formed condensate always moves toward a cooler zone to prevent re-evaporation. An aluminum corrosion resistant condensate drain designed to prevent pooling and accessible condensate trap shall be provided. Boiler shall be able to vent a horizontal distance of 80 equivalent feet.

C. SERVICE ACCESS: The boilers shall be provided with access covers for easily accessing all serviceable components. The boilers shall not be manufactured with large enclosures, which are difficult to remove and reinstall. All accesses must seal completely as not to disrupt the sealed combustion process. All components must be accessible and able to adjust with the removal of a single cover or cabinet component.

D. INDICATING LIGHTS: Each boiler shall include a diagnostic control panel with a full text display indicating the condition of all interlocks and the BTUH input percentage. Access to the controls shall be through a completely removable cover leaving diagnostic panel intact and not disrupted.

E. ACCEPTABLE MANUFACTURERS:

1. Lochinvar (basis of design)
2. Laars
3. Viessman
4. Patterson Kelley Solis with stainless steel heat exchanger
5. Riello Array

2.02 COMPONENTS

A. COMBUSTION CHAMBER: The combustion chamber shall be constructed of stainless steel.

B. HEAT EXCHANGER: Boilers shall be stainless steel constructed unit designed for pressure firing and shall be constructed and tested for 100 PSI water working pressure, in accordance with the ASME Section IV Rules for the Construction of Heating Boilers. Individual sections will have been subjected to a hydrostatic pressure test of 250 PSIG at the factory before shipment and they shall be marked, stamped or cast with the ASME Code symbol. Boilers with less than 250 PSI pressure test will not be accepted for this project. The sections shall be of a down fired counter flow single-pass design. Water ports will be sealed with graphite port connectors. The sections will be fully machined for metal to metal sealing of the gas side surfaces. The design will provide for equal temperature rise through all sections. The heat exchanger shall be designed to prevent fluid boiling. The iron shall have a minimum thickness of 3/8". The heat exchanger design should have no limitations on temperature rise or restrictions to inlet water temperature and a Cv of 100.

C. JACKETS: Stainless Steel.

D. GAS BURNER: The burner shall be constructed of a reticulated Corderite Ceramic. The burner flame shall be pre-mix type with a forced draft fan. Burner shall fire to provide equal distribution of heat throughout the entire heat exchanger. The burner shall be easily removed for maintenance without the disruption of any major component of the boiler. A window view port shall be provided for visual inspection of the boiler during firing. The gas distribution components and burner shall be enclosed with a cast-aluminum housing.

E. IGNITION COMPONENTS: The ignition hardware shall consist of Alumina ceramic insulated ignition electrodes and UV sensing tube permanently arranged to ensure proper ignition electrode and UV alignment.

F. RATED CAPACITY: The boiler shall be capable of operating at rated capacity with pressures as low as 4.0” W.C. at the inlet to the burner pressure regulator.

G. The burner shall be capable of at least 96% efficiency without exceeding a NOx reading above 10 ppm.

H. The burner and gas train shall be provided with the following trim and features:

1. Burner Firing: Full modulation with 5:1 turndown @ Continuous CO2

2. Burner Ignition: Intermittent spark

3. Safety Controls: Energize ignition, limit time for establishing flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, and allow gas valve to open.

4. Flue-Gas Collector: Enclosed combustion chamber with integral combustion-air blower and single venting connection.

5. Gas Train: Lubricated manual gas valves (2), main gas valve (motorized), ‘B’ valve, pilot gas pressure regulator, and automatic pilot gas valve. All components to be factory mounted.

6. Safety Devices: High/Low gas pressure switches, air-flow switch, and blocked flue detection switch. All safeties to be factory mounted and wired.

2.03 BOILER TRIM

A. SAFETY-RELIEF VALVE: ASME rated, factory set to protect boiler sand piping as per schedule/drawings.

B. GAUGE: Combination water pressure and temperature shipped factory installed. LCD inlet/outlet temperature gauges to be an integral part of the front boiler control panel to allow for consistent easy monitoring of temperatures factory mounted and wired.

C. LOW WATER CUT OFF: Prevent burner operation when water falls below a safe level. Low water cut off shall be factory mounted and wired. Provision for installation of a low water cut off shall be provided.

D. OPERATING CONTROLS: Boiler shall be provided with a Honeywell RM7896C series digital flame safe guard with digital display. The flame safe guard shall be capable of both pre and post purge cycles.

E. OPERATING TEMPERATURE CONTROL: Shall be a digital controller adjustable from 60 to 240 degrees F. Control shall be factory mounted and sense the inlet and outlet temperature of the boiler through resistance sensors.

F. HIGH LIMIT: Temperature control with automatic-reset limits boiler water temperature in series with the operating control. High Limit shall be factory mounted and sense the outlet temperature of the boiler through a dry well.

G. PROVIDE THE FOLLOWING STANDARD TRIM:

1. Aluminum Condensate Receiver Pan
2. Low Air Pressure Switch
3. Blocked Flue Detection Switch
4. Manual Reset Low Water Cut Off (CSD-1 Factory Mounted and wired)
5. Modulation Control, 0-20 ma operating signal
6. Temperature/Pressure Gauge
7. Manual Reset High Limit
8. Air inlet filter
9. Inlet/Outlet Temperature Display
10. Full Digital Text Display for all Boiler Series of Operation and Failures.
11. Variable Frequency Drive and Combustion Air Fan
12. Condensate Drain

H. PROVIDE THE FOLLOWING JOB SPECIFIC TRIM AND FEATURES:

1. FM or IRI controls and Gas Train
2. Diagnostic Keyboard Display for RM7800 series control
3. Provide controller to allow all boilers to communicate together as one system. BAS will/shall give a command to run only.

2.04 SOURCE QUALITY CONTROL

A. Test and inspect boilers according to the ASME Boiler and Pressure Vessel Code, Section IV. Boilers shall be test fired in the factory with a report attached permanently to the exterior cabinet of the boiler for field reference.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine area to receive boiler for compliance with requirements for installation tolerances and other conditions affecting boiler performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install boilers level and plumb, according to manufacturer's written instructions and referenced standards.

B. Install gas-fired boilers according to NFPA 54.

C. Support boilers on 4-inch- (100-mm-) thick concrete base, 4 inches (100 mm) larger on each side than base of unit.

D. Install electrical devices furnished with boiler, but not specified to be factory mounted.

E. CONDENSING BOILER ONLY – Provide acid neutralization kit and install a condensate line to drain.

F. Do not rotate condensing boiler unless multiple condensing boilers are to be used.

G. Boiler manufacturer rep shall provide Cat IV flue vent as required by the boiler manufacturer's requirements and application.

H. Boiler manufacturer rep shall provide room CO sensor / monitor for interlocking with gas shutoff valve upon detection of high CO level.

I. Boiler manufacturer rep shall provide gas consumption flowmeter for each boiler for interlocking with the BAS.

3.03 CONNECTIONS

A. Connect gas piping full size to boiler gas-train inlet with union.

B. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

C. Install piping from safety-relief valves to nearest floor drain.

D. Connect breeching to boiler outlet, full size of outlet. The boiler shall operate under positive (Category IV) or negative (Category II) stack pressure. Vent material must be listed AL29-4C Stainless Double Wall Stack.

E. ELECTRICAL: Comply with applicable requirements in Division 26 Sections.

F. GROUND EQUIPMENT:

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 FIELD QUALITY CONTROL

A. MANUFACTURER'S FIELD SERVICE: Engage a factory-authorized service representative to supervise the field assembly of components and installation of boilers, include piping and electrical connections. Report results in writing.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Manufacturer's representative shall supply a factory authorized service technician to start up the boilers.

3.05 CLEANING

A. Flush and clean boilers on completion of installation, according to manufacturer's written instructions.

B. After completing boiler installation, including outlet fittings and devices, inspect exposed finish. Remove burs, dirt, and construction debris.

3.06 COMMISSIONING

A. Engage a factory-authorized service representative to provide startup service. Start up to be performed only after complete boiler room operation is field verified t offer a substantial load, and complete system circulation. One-year warranty shall be handled by factory authorized tech.

B. Verify that installation is as indicated and specified.

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections. Do not proceed with boiler startup until wiring installation is acceptable to equipment installer.

C. Complete manufacturer's installation and startup checklist and verify the following:

1. Boiler is level on concrete base.

2. Flue and chimney are installed without visible damage.

3. No damage is visible to boiler jacket or combustion chamber.

4. Pressure-reducing valves are checked for correct operation and specified relief pressure. Adjust as required.

5. Clearances have been provided and piping is flanged for easy removal and servicing.

6. Heating circuit pipes have been connected to correct ports.

7. Labels are clearly visible.

8. Boiler, burner, and flue are clean and free of construction debris.

9. Pressure and temperature gauges are installed.

10. Control installations are completed.

D. Ensure pumps operate properly.

E. Check operation of pressure-reducing valve on gas train, including venting.

F. Check that fluid-level, flow-switch, and high-temperature interlocks are in place.

G. Start pumps and boilers and adjust burners to maximum operating efficiency.

1. Fill out startup checklist and attach copy with Contractor Startup Report.

2. Check and record performance of factory-provided boiler protection devices and firing sequences.

3. Check and record performance of boiler fluid-level, flow-switch, and high-temperature interlocks.

4. Run-in boilers as recommended or required by manufacturer.

H. Perform the following tests for each firing rate for high/low burners and for 100, 66, and 33 percent load for modulating burners. Adjust boiler combustion efficiency at each firing rate. Measure and record the following:

1. Gas pressure on manifold

2. Combustion-air temperature at inlet to burner.

3. Flue-gas temperature at boiler discharge.

4. Flue-gas carbon-dioxide and oxygen concentration.

5. Natural flue draft.

I. Measure and record temperature rise through each boiler.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel as specified below:

1. Operate boiler, include accessories and controls, to demonstrate compliance with requirements.

2. Train Owner’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in the maintenance manuals. Refer to Division 1 Section “Contract Closeout.”

4. Review data in the maintenance manual. Refer to Division 1 Section “Operation and Maintenance Data.”

5. Schedule training with Owner with at least 7 days’ advance notice.

END OF SECTION 23 52 00

SECTION 23 63 00
AIR COOLED CONDENSING UNITS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Equipment and accessories shall be prewired at the factory for single point connection. Unit shall be of domestic manufacturers only.

1.03 EQUIPMENT NAMEPLATES

A. Each piece of equipment shall have a nameplate identifying manufacturer, model number, serial number, voltage, phase, amperage, refrigerant type, etc. as applicable. For units outside, nameplate shall be stainless steel or have a protective cover to prevent sun fading.

PART 2 – MATERIALS AND METHODS

2.01 AIR-COOLED CONDENSING UNIT

A. GENERAL: Units shall be designed for installation outdoors with all parts weatherproofed and protected with outdoor paint. Fans shall have guards and motors shall have rain shields. Discharge air shall be vertical. Unit shall be U. L. Listed for outdoor installation and bear the ARI Rating Seal.

B. COIL: Condenser coil shall be copper tube with aluminum plate fins, tested at factory at 425 psi minimum, subcooler circuit and refrigerant receiver and coil fin guards. Coils shall be epoxy coated by mean of dipping and baking. Coating shall be flexible and uniformly bonded to all condenser coil surfaces. Refrigerant flooding low ambient control not acceptable. Micro-channel coil is acceptable.

C. COMPRESSORS: Shall be spring mounted, hermetic construction, with crankcase heaters and suction and discharge service valves, hot gas muffler and charging valves. Unit shall operate with R410a refrigerant. Provide five-year compressor warranty.

D. ACCESSORIES AS FOLLOWS:

1. Line voltage magnetic starter with 3 leg overload protection and winding stat protection.
2. Crankcase heater
3. Low-pressure cutout control
4. High-pressure cutout control

5. Time delay to prevent compressor short cycling

6. Time delay relay for cold weather start-up

7. Head pressure controls to allow system operation at 20°F ambient

8. Single phase protection.

E. REFRIGERANT PIPING DIAGRAM: Unit submittal data shall include a complete piping diagram showing all components, pipe sizes and balance curve for unit and AHU coil, control and wiring diagram for units. Copies shall be marked "Approved" and signed by an authorized employee of the unit manufacturer.

F. INSPECTION AND TEST: Upon completion of the installation, before start-up, an authorized employee of the unit manufacturer shall inspect the installation. If he approves it, he shall be present to observe start-up and shall spend not less than four hours observing system operation. At completion, he shall write a letter to the Owner confirming this procedure and stating the manufacturer's approval of the installation.

G. WARRANTY: Provide a five-year warranty (parts and labor) for total unit from date of substantial completion.

H. ACCEPTABLE MANUFACTURERS: Carrier and Trane.

END OF SECTION 23 63 00

SECTION 23 64 26
AIR COOLED ROTARY CHILLERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 05 00 General Mechanical Provisions

PART 2 – PRODUCTS

2.01 AIR COOLED ROTARY CHILLER

A. GENERAL: Scroll compressor, minimum capacity as scheduled on drawings, including electric motor driven compressor, purge system, electronic expansion valve, control voltage transformer, control system and starter. Unit shall have two completely independent refrigeration circuits. Unit panels, control boxes and structural elements shall be constructed of 12 gauge galvanized steel and mounted on a welded steel structural base. All parts shall be weatherproofed. Control boxes, unit panels and structural elements shall be finished with a baked on powder paint, and the structural base with an air dry paint. Coatings or paint shall withstand 500 hours in salt-spray test per ASTM B117.Insulate chiller vessel, suction elbows, motor and all cold components with 1.5” thick EPDM foam insulation to prevent condensation. Provide complete refrigerant and oil charge. Unit shall use R-134a refrigerant. Performance shall be ARI certified and meet ASHRAE 90.1 minimum efficiency requirements. Efficiency ratings shall meet the International Energy Conservation Code.

B. COMPRESSOR: Scroll type, driven by refrigerant cooled motor. Motor shall have electronic overheating protection and a power factor of 0.9 or greater. Statically and dynamically balance all rotating parts. Provide a forced feed lubrication system with oil sump, oil charging valve, hermetically sealed motor driven pump, oil filter, thermostatically controlled heater and crankcase heater. Automatic capacity control system to provide continuously variable capacity from 15% to 100% including automatic stop when load falls below 15% and automatic restarting. Provide factory installed, weatherproof, sound reduction compressor enclosure and discharge piping sound reduction wraps.

C. CONDENSER AND FANS: Condenser coils shall have .0055” thick aluminum fins, mechanically bonded to internally finned seamless copper tubing. Coils shall be factory coated to prevent corrosion or copper fins may be provided. The condenser coil shall have an integral sub-cooling circuit and provide oil cooling for the compressor bearing and injection oil. The condenser shall be factor leak tested at 500 psig. The condenser fans shall be vertical discharge direct drive type, with three phase motors, permanently lubricated ball bearings and internal thermal overload protection. Fan assembly shall be statically and dynamically balanced, constructed of zinc coated steel and have sound reduction kits and fan guards. Provide louvered hail guards on coils and security wire guards around compressor access. Fans shall be ultra quiet design with TEAO

motors. Micro-channel coils are acceptable. Coils shall be coated with corrosion resistant epoxy utilizing a dip and bake method. Coating shall be flexible and uniformly bonded to all coil surfaces.

D. EVAPORATOR: Shell and finned tube type, designed, constructed, tested and stamped in accordance with ASME Code for Unfired Pressure Vessels, as applicable. Each tube shall be individually replaceable with tube ends rolled into tube sheets. Unit shall be built for a working pressure on the refrigerant side suitable for the refrigerant used, and for 200 psi on the water side. Provide safety relief valve with discharge piped to a safe point for water and refrigerant systems. Insulate with 1.5" thick EPDM insulation, sealed on outside surface with vinyl lacquer finish. Provide factory mounted heat tape with thermostat to protect the evaporator from freezing at ambient temperatures down to -20°F. Provide water drain connection, vent and fittings for factory installed sensors. Should a shell and finned tube evaporator not be available in a specified size, manufacturer shall provide an intake strainer with 40 mesh screen. Strainer shall be sized to limit pressure drop to 2 psi at full flow. This generally requires a strainer one to two sizes larger than the pipe size to the chiller. Coils shall be coated with corrosion resistant epoxy utilizing a dip and bake method. Coating shall be flexible and uniformly bonded to all coil surfaces.

E. CONTROL SYSTEM: All controls shall be housed in weather-tight enclosure with full opening access door and external lockable operator handle. All controls, including sensors, shall be factory mounted and tested prior to shipment. Control system shall include the following:

1. Unit start-stop switch and operating signal light with provision for automatic start-stop.

2. Internal controls to maintain leaving water temperature.

3. Motor current controller with maximum load selector switch for 40% to 100% full load current to permit manual control of power demand.

4. Digital readout panel indicating condenser, evaporator, lubricating oil and purge pressures, voltage, amps.

5. Protective controls with low evaporator temperature, high condenser pressure, high motor temperature, loss of refrigerant charge and low oil pressure, factory wired to independently stop compressor motor. Each fault type to have associated indicator and manual reset.

6. Anti-recycle timer to limit starting to once every 15 minute or as recommended by manufacturers. Mount in either control panel or starter.

7. System shall be microprocessor based and designed to accept start-stop, demand limiting and temperature reset signals from a remote controller or energy management system using dry contact closures and 2-10VDS or 4-20 ma signals. Input signals shall include, but not limited to, leaving chilled water temperature and chiller current limit setpoint.

8. Microprocessor control shall de-energize unit if there is a momentary interruption of power, or loss of power that would damage the machine. Unit shall automatically restart when power is available and anti-cycle timer has counted down.

9. Provide a powered 120 volt, ground fault, duplex convenience outlet

10. Provide a BACNET interface unit to allow the energy management system to monitor and control the chiller operation.

F. STARTER: Unit mounted, X-L type, to include the following:

1. Overload protection in all three legs.

2. Phase loss and low voltage protection.

3. Chiller mounted, NEMA 3R cabinet.

G. ISOLATORS: Provide factory supplied, minimum 3" load point specific, color coded, encased neoprene isolators matched to the specific chiller supplied. Provide a minimum of four isolators per side evenly distributed around the perimeter of the unit.

H. SOUND RATINGS

1. Emitted sound pressure shall note exceed 67 dBA as measured from the ends of the unit and 70 dBA at 30 feet from the sides of the unit.

2. Sound power levels shall not exceed specified levels in the listed octave band.

63 Hz	88 dBA
125 Hz	97 dBA
250 Hz	97 dBA
500 Hz	96 dBA
1000 Hz	92 dBA
2000 Hz	90 dBA
4000 Hz	82 dBA
8000 Hz	77 dBA

I. INSPECTION AND TEST: Upon completion of installation, an authorized representative of the manufacturer of the chilling unit shall supervise starting the chilling unit, the piping and the controls, and shall forward to the engineer a letter confirming this inspection and stating approval of the installation. This same representative shall be present at the time of the operational test and shall observe equipment performance.

J. WARRANTY:

1. The Chiller Manufacturer shall provide a full machine parts, labor, oil and refrigerant warranty for a period of one year. Warranty shall start the date of the substantial completion certificate.

2. The Chiller manufacturer shall provide an extended warranty for years 2-10 beyond the first year warranty for labor, parts, refrigerant, and compressors.

3. Provide an extended parts-only warranty for the refrigeration compressor.

a. Extended warranty is in addition to the first-year warranty.

b. The warranted compressor assembly consists of the compressor starter, valves, and the motor compressor drive

c. In the event of failure, provide a new motor compressor. At the Owner's option, provide new warranted parts.

K. TRAINING: Provide a minimum of 8 hours classroom service training by factory trained instructor for each type of chillers.

L. SUBMITTALS: All submittals shall be prepared by the Salesman that calls on the Engineer from the successful supplier.

M. ACCEPTABLE MANUFACTURERS:

1. Alternate No. 3: Daikin Air-Cooled Chillers

2. Alternate No. 5: Trane Air-Cooled Chillers

3. Alternate No. 7: Carrier Air-Cooled Chillers

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

3.02 TRAINING

A. Provide a minimum of 8 hours classroom service training for each type of chiller.

B. Training shall be conducted by a factory trained instructor.

END OF SECTION 23 64 26

SECTION 23 65 00
VARIABLE REFRIGERANT DX SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of multiple evaporator-fan and variable capacity compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.02 SUBMITTALS

A. Product Data: For each unit indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics including:

1. Piping schematics with intended piping line lengths indicated on the drawings (piping plan to be coordinated between manufacturer and contractor prior to submittal. Generic piping schematics are not acceptable). The manufacturer shall include notes on the piping schematics indicating locations where expansion loops shall be installed.

2. Wiring schematics showing electrical connection requirements, and field control wiring terminations.

3. Field refrigerant charge volume shall be noted along with factory charge. Note schedule limitations.

4. Manufacturer’s performance data shall reflect specified conditions. Nominal capacities are not acceptable. Ratings shall allow for piping lengths, scheduled ambient temperatures, etc.

B. Operation and maintenance data.

1.03 CONTRACTOR MUST HAVE COMPLETED THE MANUFACTURER’S INSTALLATION TRAINING. THE CONTRACTOR SHALL SUBMIT A COPY OF THE TRAINING COMPLETION CERTIFICATE FOR THE PROJECT MANAGER AND AT LEAST 2 PIPE INSTALLERS WITH THIS SUBMITTAL.

1.04 QUALITY ASSURANCE

A. The units shall be listed by the Electrical Laboratories (ETL) and bear the cETL label.

B. All wiring shall be in accordance with the National Electric Code (NEC).

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings." Provide certified efficiency ratings per AHRI-1230 standard. (DOE Waiver is not acceptable) Scheduled EER and IEER ratings scheduled shall be considered minimum efficiency allowed.

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings." Provide certified efficiency ratings per AHRI-1230 standard. (DOE Waiver is not acceptable) Scheduled COP ratings scheduled shall be considered minimum efficiency allowed.

E. Units shall be designed to operate with HCFC-free refrigerants.

1.05 WARRANTY

A. All VRF equipment and controls shall be warranted by the manufacturer for a period of 5 years from the date of startup. (Startup not to exceed 6 months from delivery). The warranty shall include both parts and labor and refrigerant. The condensing units shall include an additional 5 years (total of 10 years) of parts only warranty covering the entire condensing unit.

1.06 ALL WARRANTY SHALL BE EXECUTED BY THE MANUFACTURER'S AUTHORIZED REPRESENTATIVE. CONTRACTOR WARRANTY SHALL NOT BE ALLOWED.

1.07 COPIES OF THE WARRANTY PAPERWORK AND STARTUP DOCUMENTATION SHALL BE SUBMITTED UPON CLOSE OUT OF THE INSTALLATION.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:

B. Manufacturers: Subject to compliance with project requirements, provide products by one of the following:

1. Carrier - basis of design
2. Daikin AC
3. Mitsubishi

C. GENERAL DESCRIPTION

D. The variable capacity, heat recovery and/or heat pump air conditioning system shall be a Variable Refrigerant Volume (heat and cool model) split system as specified. The outdoor unit is a direct expansion (DX), air-cooled heat recovery/heat pump, multi-zone air-conditioning system with variable speed driven compressors using R-410A refrigerant.

2.02 AIR-COOLED VARIABLE REFRIGERANT VOLUME CONDENSING UNIT

A. Outdoor units shall be provided for either 460/3/60 as scheduled.

B. VFD Inverter Control – Each condensing unit shall use a high efficiency, variable speed "inverter" compressor coupled with inverter fan motors for superior part load performance. Compressor

capacity shall be modulated automatically to maintain constant suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads.

C. Systems shall use a field installed 16 or 18 AWG, 2-wire, stranded, non-shielded and non-polarized daisy chain control wiring to interconnect the condensing units, branch selectors, and fan coil units.

D. Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.

E. Condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, and refrigerant regulator.

F. Units shall be capable of operating down to zero degree F ambient air.

G. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

H. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.

I. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed milled steel panels coated with a baked enamel finish.

J. Condenser fan shall be direct drive motors that have multiple speed operation via a DC (digitally commutating) inverter.

K. CONDENSER COIL:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.

3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.

4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.

5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

L. COMPRESSOR:

1. The inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.

2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G2-type” with a maximum speed of 7,980 rpm.

3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

4. The capacity control range shall be as low as 4% to 100%.

5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.

6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

7. Oil separators shall be standard with the equipment together with an intelligent oil management system.

8. The compressor shall be spring mounted to avoid the transmission of vibration.

9. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

2.03 CONTROLS

A. CONTROL MODULE

1. Manufacturer to provide control module to interface with other HVAC equipment and device, such as outside air pretreatment unit, exhaust fans, and emergency shut-down switch.

B. CENTRAL CONTROLLER

1. The building shall be installed with a web-enabled factory native central controller in tandem with the BACnet module to facilitate the remote monitoring and control interface to the City’s maintenance office. The manufacturer native controller shall provide web users to manipulate the following functions:

a. On/Off Control

b. Schedule-Adjustment (schedules to be maintained locally and BAS)

c. Mode Selection – See control sequence for heat/cool changeover control

d. Setpoint Control (Independent heating and cooling setpoints available)

e. Operational Status and Alarm Notifications

f. Provide with battery backup and USB port for software updates

g. User and Administrator Levels with password protection.

h. Customize groups and zones

PART 3 – METHODS

3.01 INSTALLATION

A. Mechanical contractor must complete an accredited installation training class prior to starting the installation. The contractors PM and piping foreman must each have certification.

B. Installation shall be per manufacturer's recommendations. Extra care shall be provided to allow for expansion and contraction of piping. Contractor shall install expansion joints on gas lines per the manufacturer's recommendations.

3.02 FIELD QUALITY CONTROL

A. The installing contractor shall complete the installation and complete a total system pressure test of 550 psi for 24 hours prior to startup.

B. THE MANUFACTURER OR MANUFACTURER'S AGENT SHALL BE RESPONSIBLE FOR ALL EVACUATION AND CHARGING OF REFRIGERANT FOR EACH SYSTEM AT STARTUP. CONTRACTOR STARTUP IS NOT ALLOWED.

C. The manufacturer's agent shall provide the following startup services:

1. Evacuation of the piping system to a 400 micron vacuum (hold 3 hours)

2. Proper charging of the system with R-410A (Refrigerant provided and installed by the installing contractor)

3. Execution of all standard diagnostics.

4. Connection to the system with the manufacturer's Service Checker software and creating an operational log of the following information for verification:

   a. Each system operates with proper temperatures, delta T and superheat conditions in both cooling and heating modes.

5. A digital copy of these operational logs shall be stored by the manufacturer's agent as well as delivered to the owner with warranty documentation.

END OF SECTION 23 65 00

SECTION 23 73 13
INDOOR AIR HANDLING UNITS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

B. Documentation

1. Product Data for TIPS: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

3. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 – PRODUCTS

2.01 AIR HANDLING UNITS

A. CABINETS: Unit casing shall meet ASHRAE 111 Class 6 leakage and a maximum of 1% airflow at +/- 8” total static pressure. Unit shall be of double wall construction with encapsulated 2” thick, 3lb minimum density insulation for acoustical and condensation control. Sections and panels shall be bolted together with insulating gasket to prevent sweating at the joints. The interior liner shall be 20-gauge galvanized steel and shall provide a smooth, cleanable surface with no exposed insulation. The unit base floor shall be heavy duty walk-on floor construction. Exterior wall panels shall be removable and constructed of 16 gage G90 mill galvanized steel. Interior surface shall be galvanized and exterior primed with rust inhibiting primer and painted with two heavy coats of enamel paint. Exterior panels of unit may be galvanized finish if unit is located in mechanical room or above ceiling. A rigid, welded framework shall support the panels, coils and fan. Coil casings shall be stainless steel. Drain pans shall be insulated, double wall type of 16 gage Type 304 stainless steel, sloped for positive drainage and extend a minimum of 12” beyond the coil. Provide drain pan for all coils, including heating coils. Provide minimum 12-gauge rails or channels on bottom of unit to ensure bottom plates do not contact floor or concrete pad. Coordinate drain location with mechanical room layout. Units with down discharge or return from below shall have a 3” high “water dam” around duct openings to prevent water from leaking through openings. All units shall be pre-assembled and balanced at the factory, and then shipped to the site in that condition.

B. ARRANGEMENT AND COMPONENTS: Units shall be horizontal or vertical as shown on the Drawings. Provide face and bypass dampers, coil sequence or other item that is shown or described in the temperature controls sequence. Unless noted otherwise, heating coils shall be in the reheat position. Where face and bypass dampers are specified, the bypass shall be internal to the unit, and not bypass the heating coil. Where outside air is shown connecting directly to the unit, provide manual return air damper to set return air/outside air ratio.

C. FANS: Single wheel, airfoil DWDI Class II fan operating below first critical speed, and selected for high operating efficiency and low noise generation. Fans for VAV air handling units shall be selected so that their peak efficiency is as close as possible to the 100% output point of the system without generating aerodynamic stall at 50% output. Fan shall be mounted on grease lubricated ball bearings having 200,000 hours average life. The fan/drive/motor assembly shall be internally mounted and factory isolated from the enclosing cabinet with 2” minimum deflection spring isolators and flexible connection to unit housing. Select spring isolators under conditions present when operating at 50% of full output. Provide extended grease lines to exterior of unit or grouped inside at access panel at the drive side of the fan assembly. Fan shaft shall be solid steel.

1. Draw Through Air Handling Unis - Variable Air Volume

    a. Supply Fans shall be double width, double inlet, non-overloading, forward curve fan as required.(Electronically Commutated (EC) motor direct drive plenum fans with backward inclined impeller are acceptable.)

    b. Stainless steel condensate pan with positive slope in all directions to outlet; condensate drain pan with a minimum of 1-1/2” waterproof insulation.

    c. Units and coils are to be cleaned to as new condition when to be turned over to the District.

    d. Belts and filters are to be checked or replaced, and all bearings to be greased/oiled.

D. DRIVE: Provide adjustable motor mount, V-belt drive with Browning or Gates adjustable motor sheave rated at 175% BHP. Drive shall have a minimum of two individual “B” sized belts. Add static pressure for filter resistance and unit coil, damper, casing and conversion losses to scheduled external static pressure to select motor size. Motor shall not overload if system static pressure drops 1/4" at selected RPM. See Motors Section for motor requirements. Provide alternate size sheaves if required to meet air flow requirements as determined by Commissioning Agent or Test and Balance Contractor. At substantial completion provide a spare set of fan belts for each unit. Alternative direct drive plenum fan type units are acceptable as long as they need dimensional requirement.

E. ACCESS DOORS: Provide hinged, double wall, insulated and gasketed access doors with Ventlock 260 or equal handles on both inside and outside of casing, on each side of unit between fan and coil sections. Provide 18” wide access door in side of unit at drain pan connection to observe and clean drain pan. Provide access doors on both sides of the unit at the upstream and downstream side of the coils, filters and motor/fan assembly. Both side of coils shall be accessible.

F. WATER COILS: Shall be 1/2” or 5/8”, .020” thick wall copper tube, .006” or .008” thick aluminum fin with belled collars, tested at 300 PSI with ARI certified ratings. Coil connections shall be counterflow with supply at the very bottom and outlet at the very top of the coil. Coil casings shall be stainless steel. Provide resistance plate in hot deck of multizone units without heating coil. Mount coils on tracts for easy removal without requiring disassembly of the air handling unit. Coils shall be drainable, non-trapping circuits. Headers shall have drain and vent connections extended to the outside of the unit casing. Install rubber grommets at all pipe penetrations of the cabinet. Coils in outside air pre-treatment section shall have a flexible polymer e-coating (ElectroFin).

G. FILTERS: Provide filter rack for 2" thick filters, maximum velocity 350 FPM. See specification section 23 41 00 for HVAC Air Filters. Filter dimensions shall be per those listed in that section, NO EXCEPTION.

H. NAMEPLATE: Provide a durable, deep etched, 0.25” thick factory installed aluminum nameplate, permanently mounted with the following information: Unit ID as indicated on the contract drawings, Serial Number, Model Number, CFM, SP, Motor HP, Unit Power Supply – V/PH/A, Supply Fan Type, Coil GPM and PD, Sales Order Number and Date of Manufacture.

I. SUBMITTAL: Provide a 1/4" scale drawing of each AHU room showing proposed unit placement, dashed-in access space required, drive location, coil piping connections and condensate drain connection. Provide side elevation drawing indicating fan placement/rotation, and discharge air opening, showing proper coordination of arrangement with the specified ductwork. Submittal shall include fan curve with efficiency and horsepower curves, and noise generated by octave. For VAV units, submit fan curves for operation at 50% and 100% of full output, while maintaining constant static pressure. Also include this data for the next larger and smaller fan for the unit. All submittals shall be prepared by the Salesman that calls on the Engineer from the successful supplier.

J. ACCEPTABLE MANUFACTURERS: Carrier, Daikin, Thermal, and Trane.

2.02 MOTORS

A. Refer to Section 23 05 13 for motor requirements.

B. All motor shall be TEFC type.

C. All AHU motors to have split bolt connectors. All other motors 10 HP and larger motors shall be provided and installed with copper alloy split bolt connectors, Tyco gelcap motor connector kit or other listed multi-tap connector. Insulated with rubber and electrical tapes. Wire nuts are not acceptable.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings. AHU supplier and mechanical contractor shall be responsible for providing and installing AHUs that will fit thru existing doors and stairs in either modules or knocked down into component parts (fans, coils, panels and bases) as required for each mechanical room. All fans

that are required to be dissembled to fit thru the existing doors will require a certified field dynamic balance to ANSI /AMCA 204-96 BV-3 standards after final assembly. All units will require the contractor to have a factory trained & certified person responsible for dissemble and reassemble of each knocked down type AHU. The AHU manufacturer shall inspect the AHUs after final assemble and provide a letter with the standard warranty to the owner that the all AHUs have been properly assembled to meet ANSI /ASHRAE 111-88 air leakage class 9.

3.02 EQUIPMENT PADS

A. Provide 6” thick concrete pad for each air handling unit. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge.

3.03 ATTIC SHOCK

A. Provide an additional set of filters for each AHU after substantial completion.

B. Provide a spare set of belts for each AHU.

END OF SECTION 23 73 13

SECTION 23 81 26
SPLIT SYSTEM AIR CONDITIONERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC.

PART 2 – PRODUCTS

2.01 DUCT FREE SPLIT SYSTEM

A. GENERAL: System shall consist of outdoor condensing unit connected to one or more duct free, wall or ceiling mounted fan coil units. System shall be designed to operate as a unit complete with microprocessor control system.

B. AIR COOLED CONDENSING UNIT

1. HOUSING: Cabinet shall be constructed of galvanized steel, bonderized and coated with baked-enamel finish. Provide access panels for ease of service.

2. COMPRESSOR: Fully hermetic reciprocating or scroll type operating with R410a refrigerant. Unit shall have internal protection for over temperature and over current. Provide crankcase heater. Refrigeration system shall have gage ports, service valves, accumulator, filter dryer and pressure relief. Heat pump units shall have reversing valve and heating mode metering device.

3. CONDENSER FAN: Direct drive propeller type with internally protected, totally enclosed motor.

4. CONTROLS AND SAFETIES: Unit shall have time delay restart, automatic restart on power failure, safety lockout, high and low pressure safeties.

C. EVAPORATOR UNIT

1. GENERAL: Indoor, ceiling or wall mounted, direct expansion fan coil unit complete with electric controls, microprocessor control system and integral temperature sensing.

2. FAN: Direct drive tangential blower with automatic motor-driven vertical air sweep. Fan motor shall be three speed type.

3. COIL: Copper tube aluminum fin with refrigerant metering device. Provide condensate drain pan and drip pan under headers as required to prevent drip off unit.

4. CONTROLS: Shall be microprocessor-based and control space temperature, determine optimum fan speed and run self-diagnostics. Provide remote wireless controller for programming and temperature adjustment.

5. FILTERS: Factory supplied, permanent cleanable type with rack.

D. ACCEPTABLE MANUFACTURERS: Daikin, Carrier, and Trane.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

B. Provide prefab rail-type roof curbs. Install and mount unit as shown on the mechanical detail plan.

END OF SECTION 23 81 26

SECTION 23 82 39
UNIT HEATERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General Mechanical

PART 2 – PRODUCTS

2.01 ELECTRIC UNIT HEATER

A. GENERAL: Provide a U. L. Listed heater with formed steel casing with baked enamel paint finish, fan guard, ceiling mounting bracket, adjustable horizontal and vertical discharge louvers and direct drive propeller fan.

B. CONTROLS: 24-volt controls transformer, staging contactors, fusing per NEC, thermal overloads, single point electrical connection, terminal panel, hinged door to control panel and unit-mounted thermostat. Provide two stages of control for units 25 kw and larger.

C. HEATING ELEMENTS: High mass finned tubular heating elements.

D. ACCEPTABLE MANUFACTURERS: Carrier, Markel, Modine, Reznor and Trane.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

END OF SECTION 23 82 39

SECTION 26 00 00
GENERAL ELECTRICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL REQUIREMENTS

A. Provide all supervision, labor, equipment and materials required for the installation of complete and operating electrical systems in the building. Pay all fees and obtain all permits related to construction activities and utility service installation.

1.03 GUARANTEE

A. All materials, apparatus and equipment furnished and installed under this Section of these Specifications shall be new and free from any defects when accepted by the Owner and shall be guaranteed in writing for a period of one year from the date of acceptance by the Owner.

1.04 COORDINATION

A. Coordinate work of this Division with that of other Divisions so that various components of the building will be installed at the proper time, will fit the available space and will allow proper service access to those items requiring maintenance. This means adequate access to all equipment, not just equipment installed in this Section.

B. Where various items of equipment and materials are specified and scheduled, the purpose is to define the general type and quality level, not to set forth the exact trim required to fit the various types of ceiling, wall or floor finishes. Provide materials which will fit properly the types of finishes actually installed.

1.05 DRAWINGS

A. The drawings indicate approximate locations of the various items of electrical systems. These items are shown approximately to scale and attempt to show how these items should be integrated with building construction. Locate all the various items by on-the-job measurements, conformance with Contract Documents and cooperation with other trades.

B. Prior to locating light fixtures, confer with Architect as to desired method of locating fixtures in the various areas. In no case should fixture locations be determined by scaling drawings.

C. All light fixtures, speakers and other ceiling devices shall be located to conform to the ceiling grid system. Examine all drawings to become familiar with this requirement. Lighting fixtures in mechanical spaces are shown in their approximate location only. Do not install light fixtures until mechanical piping and ductwork is installed, then install lights in a location to provide best

lighting.

D. In certain instances, the Architect may require relocation of outlets, switches, etc. Where relocation is within five feet of location shown on drawings, and when Contractor is informed of necessary relocation before work is begun on this portion of the job, no extra compensation will be allowed.

E. The drawings are schematic in nature and are not intended to show exact locations of conduit, but rather to indicate distribution, circuitry and control.

1.06 CHPS REQUIREMENTS

A. Informational Submittals: Texas Collaboration for High Performance Schools (CHPS) product information and applicable credits that are available to contribute towards a CHPS Verified project. CHPS Verified combines project management, the CHPS Criteria, and a third-party assessment to ensure that the school project is designed and built to the highest performance standards.

B. Contractor is responsible for completion and transmittal of ALL construction-related documentation required for CHPS Verification.

C. Refer to Sections 01 35 10 and 01 81 10 for additional requirements.

D. Applicable CHPS points:

1. Light Pollution Reduction. Contractor shall provide lighting analysis to indicate project supplied equipment will meet the requirements for credit. During construction, contractor shall adjust lights and provide shielding as necessary to meet requirements as determined by field measurements.

2. Minimum Energy Performance

3. Superior Energy Performance

4. Energy Management Systems: Contractor shall provide training and manuals for maintenance personnel for lighting control system.

5. Fundamental Building Systems Testing and Training. Contractor shall assist in verifying the lighting control system operation and make modifications as required to ensure compliance.

6. Mercury Reduction. All lamps supplied on this project shall meet the maximum mercury content as prescribed in EQ2.3.2. Indicate compliance on the submittal.

1.07 INTENT OF DRAWINGS AND SPECIFICATIONS

A. The drawings and specifications are intended to be complimentary. Any work exhibited in either of them, whether in the other or not, is to be executed according to the true intent and meaning thereof, the same as if set forth in all.

1.08 ALTERNATES

A. Determine the scope of each specified alternate proposal by carefully reading all Divisions of the Documents. The Bid Form contains information explaining the extent of the construction to be performed under a specific alternate. Alternate proposals, which are not predominantly electrical in scope, are described in other Divisions of these Documents.

1.09 CODES

A. All materials and their installation shall be in accordance with the National Electrical Code, local building codes and the National Safety Code. Nothing in the plans and specifications shall be construed to permit work not conforming to the most stringent of the codes. Particular attention shall be paid to the U. L. codes for fireproofing of conduit, electrical devices and light fixtures that are part of or pass through fire rated ceilings, walls and floors.

1.10 VISITING THE SITE

A. The Contractor shall be familiar with the Drawings and Specifications and shall have examined the premises and understand the conditions under which he will be obligated to operate in performing the contract. No allowance shall be made consequently for any error through negligence in this regard.

1.11 ELECTRICAL SERVICE

A. GENERAL: Obtain (during the bidding period) from the Power Company all required information to provide a complete electrical service installation as shown on the Drawings.

B. FEES: Pay all fees and installation costs charged by the Power Company for temporary service. Power Company fees and charges for the permanent service will be paid by Owner. Kilowatt hour charges shall be paid by contractor until building is accepted by Owner.

C. SERVICE: The service characteristics are 480Y/277V, 3 phase, 4 wire. The Power Company is CenterPoint Energy.

D. SERVICE ENTRANCE: Provide CT/meter, service rack, pad for pad mounted transformer, cable tap box, protective bollards or other special construction as required by the Utility Company. Refer to Utility Company standards.

1.12 TEMPORARY SERVICE

A. Provide a temporary electrical service for construction power. Size and voltage as required for construction activities as specified by the General Contractor. Construction site distribution shall be overhead and comply with NEC and OSHA Standards.

1.13 GENERAL REQUIREMENTS FOR ALL MATERIALS

A. Provide all parts and accessories necessary for equipment and complete installation.

B. Provide factory applied finish on all exterior surfaces of electrical equipment. Any item which has the finish marred must be refinished to a new condition before final acceptance.

C. Provide three copies of spare parts lists and operating and maintenance instructions for all distribution apparatus, major equipment, and auxiliary systems. These shall be bound in folders with suitable identification on front cover. Deliver to Architect prior to final acceptance.

D. All materials must be new and of good quality and shall bear the stamp of approval of the Underwriters' Laboratories, Inc. (U. L.). Equipment and materials shall be used and installed consistent with the U. L. testing and U. L. requirements. All materials shall be certified to not contain any asbestos, PCB's or other material banned by the Environmental Protection Agency.

1.14 SUBMITTALS

A. The purpose of these submittals is to attempt to aid the contractor in such a manner that improper or unacceptable materials are not delivered to or installed on the job. Approval of these submittals shall not be construed as releasing The Contractor from compliance with the Contract Documents. All materials and equipment shall be subject to final acceptance by the Engineer at completion of construction.

B. Equipment and material submittals must show sufficient data to indicate complete compliance with contract documents as follows:

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.

4. Where equipment and material has related to meeting the building CHIPS (Collaborative for High Performance Schools) Requirements, submittal shall indicate compliance with the respective CHIPS criteria.

C. Catalog data must be clearly marked to indicate the item or model number being submitted and must include all specified accessories. All information on a catalog sheet not pertaining to the item being submitted must be marked out.

D. All submittals must be bound in book form with a table of contents listing all items in that specific submittal. Loose catalog sheets or drawings will not be acceptable. All submittals on the project need not be submitted in one book. The front sheet of each copy of the submittal shall have the following typed information:

1. Job name and location.

2. General Contractor's name, address, Project Manager's name and telephone number.

3. Submitting Sub-contractor's name, address, Project Manager's name and telephone number.

4. Supplier's company name, address, salesman's name, and telephone number.

5. Signature of an officer or attorney-in-fact of the Sub-contractor with date and title and a statement that the submittal materials and equipment comply with the contract Documents.

6. Any submittal without all the above information will be rejected without review.

E. For any item to be installed in or on a finished surface (such as tee bar acoustical ceiling, plaster wall), Contractor certifies by making the submittal that he has checked all applicable contract Documents and that the item submitted is compatible with the surface finish on which it is to be installed.

F. Submit shop drawings and/or brochures for:

Switchboards	Panelboards	Transformers
Circuit Breakers	Disconnected Switches	Time Clocks
Light Fixtures	Wiring Devices	Phase Loss Monitors
Lighting Control System	Sounds Systems	Fire Alarm System
Starters/VFD's	Security Systems	Access Control
TVSS	Audio and Video	Network Cabling
Coordination Drawings	Security Cameras	

G. If a submittal is returned to the Contractor marked “Rejected” or “Revise and Resubmit”, only one (1) additional submittal will be permitted without the Contractor incurring charges for the additional re-submittals. Lee Truong & Yu Engineers (LTY) shall be reimbursed by the Contractor for any expense in connection with any necessary submission in addition to the two (2) submissions allowed. Contractor will be billed by LTY at a rate of $125/hr for these occurrences.

1.15 SUBSTITUTIONS

A. The names of manufacturer and model numbers have been used in the Contract Documents to establish types of equipment and standards of quality. If only one manufacturer is named for a specific item of equipment (except lighting fixtures), the specified manufacturer will be the only acceptable one. Where more than one manufacturer is named for a specific item of equipment, only one of these manufacturers will be considered for approval. Where only one manufacturer is mentioned with the phrase "or approved equal", Contractor may submit an alternate manufacturer as outlined in Special Conditions. No attempt has been made to determine if each manufacturer listed for a particular item of equipment will produce material that will comply with all requirements. If a submittal contains sufficient information to prove compliance with the Contract Documents, then that submittal will be acceptable.

B. Alternate light fixtures may be submitted but a substitute fixture must be equal from the standpoint of materials, construction, and performance. Request for substitution must be accompanied by complete data and descriptive sheets during the bidding period as described in the Architectural Sections.

1.16 PROTECTION OF EQUIPMENT

A. Do not deliver equipment to jobsite until progress of construction has reached the stage where equipment is needed, or until building is closed in enough to protect equipment from the weather. Equipment allowed to stand in weather will be rejected, and Contractor is obligated to furnish new equipment at no cost to Owner.

B. Adequately protect equipment (including all Owner-furnished items) from damage after delivery to job. Cover with heavy cloth as required to protect from damage.

C. Equipment which has been damaged by construction activities will be rejected. Contractor shall furnish new equipment at no cost to Owner.

1.17 FOUNDATIONS AND EQUIPMENT SUPPORTS

A. GENERAL: Provide all foundations and supports.

B. CONCRETE HOUSEKEEPING PADS: Minimum 4" high concrete pad indoors and 6" high outdoors to be provided under Division 3, for all floor mounted equipment. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around unless otherwise shown. Reinforce pads with 6" x 6" woven wire mesh and #4 bar around perimeter. Tool pad to form chamfered edge and smooth steel trowel finish.

C. OUTDOOR ELECTRICAL EQUIPMENT: Provide structural pad to support pad mounted transformers, outdoor switchgear, and generators. Provide galvanized pipe or angle iron structure to support weatherheads, meters, and outdoor protective devices and disconnect switches. Provide bollards to protect equipment installed in traffic areas.

D. INSIDE ELECTRICAL EQUIPMENT: Securely attach panels to block walls with concrete bolts. When attaching to sheetrock or other less substantial walls, provide blocking and unistrut cross supports to securely attach panel to structural members. Where panels are required to be freestanding provide angle iron support structure bolted to floor and building structure.

E. VIBRATION ISOLATION: Install dry type transformers on four waffle pad type isolators.

1.18 NOISE

A. Eliminate any abnormal noises which are not considered by the Architect to be an inherent part of the systems as designed. Abnormal buzzing in equipment components will not be acceptable.

1.19 TESTING BY CONTRACTOR

A. GENERAL: All wiring, instruments, apparatus, and equipment shall be tested for continuity, ground and short circuits before the circuits are energized. For 120 Volts circuits, the neutral/s may require disconnecting. A complete record of all testing shall be submitted to Owner at completion.

B. GROUND TESTING: The resistance of the grounding system to ground shall not exceed 3 ohms for water pipe ground or 6 ohms for driven ground rods. If tests indicate a higher value, additional ground rods shall be installed to reduce the resistance to a value of 6 ohms or less. Whenever connection is required to an existing ground conductor, tests shall be made before connection to

ensure that the existing ground conductor is unbroken and continuous. Ground tests shall be performed after at least 7 days of dry weather with test meter supplying a minimum of 50 amps to the ground rod. Auxiliary current electrode shall be approximately 85 feet from ground rod and auxiliary potential electrode shall be 62% of this distance from the ground rod in between the two rods.

C. INSULATION TESTING: Test all electrical equipment bussing, underground feeders and feeders 1/0 and larger at 85% of rated insulation value. Insulation tests shall be made with a 500 volt "Megger" as manufactured by James G. Biddle Company or equal. Test one conductor at a time with other two grounded. Attempt to raise voltage to maximum in one minute. Do not exceed 2 MA. Polarization Index (amps ratio - 1 minute/10 minutes) to be at least 3 unless approved otherwise.

D. ADDITIONAL TESTING: The Contractor shall make such other tests as may be or become necessary to assure satisfactory operation of each unit device or equipment.

1.20 RECORD DRAWINGS

A. Obtain a set of project drawings and keep these at jobsite during construction. During the course of construction, mark on these prints any changes which are made, noting particularly locations for those items which will need to be located for servicing. At completion of job, mark each sheet "Record Drawings", date and deliver to Architect.

1.21 OWNER'S INSTRUCTIONS

1. Provide the following periods of on-site instructions to Owner's designated personnel upon completion of the systems' installation:

Electrical Systems:	4 Hours
Fire Alarm and Sound System:	4 Hours
Generator and ATS:	4 Hours

1.22 MOUNTING HEIGHTS

A. GENERAL: Heights are measured to centerline from the finished floor. Where devices are located in block walls Architect may require height to be adjusted so junction box is in a desired relationship with the mortar joint. Device must still be mounted within the acceptable height range for ADA.

B. DEVICE:

Light switch	46"
Receptacle	18"
Receptacle at counter	7"-20" above countertop, not in backsplash; maintain elevation of receptacles evenly above countertop
Data outlet	18"
Telephone outlet	18"
Telephone outlet at counter	7" above countertop
Wall telephone	46"

Desk telephone	18"
Clock telephone	12" below ceiling or 96" maximum
Wall exit light	Bottom 4" above door frame of 96"
Fire alarm pull station	46"
Fire alarm horn or flasher	on ceiling
Wall TV oulet	18"
Outdoor bells or speakers	10"-0" (or shown on the Architectural Drawings)
Wall Pack Lights	14"-0" (pr shown on the Architectural Drawings)

1.23 ELECTRICAL INSPECTIONS

A. Contractor shall formally request inspections from Lee Truong & Yu Engineers (LTY) to review all electrical installations. Inspections shall include but not be limited to: system tests, grounding tests, underground installations prior to backfill, rough-in installations, wall cover inspections, above ceiling inspections, final inspection.

B. Information required from Contractor on every request for inspection is as follows:

1. Specific type of inspection (i.e. underground conduit installation, wall cover up, fire alarm demonstration, etc.).

2. Exact location of test (i.e. area of building with wing or room numbers).

3. Description of test (i.e. partial inspection, walls only, chase walls, wall cover, ceiling cover, etc.)

4. Exact time of any tests that are to be observed. Estimated time test will start will not be acceptable.

5. Verification from General Contractor with name of person that verified, that specific test has been verified by the Contractor and all sub-contractors to meet all requirements of the Specifications and Codes (prior to inspection request).

C. Contractor shall provide a MINIMUM of 48-hour notice prior to requested inspection time, no exceptions.

D. INSPECTION REPORTS: After each inspection, LTY will generate an inspection report and distribute promptly. The Contractor will then be given 7 working days from date of report to address all deficiencies listed on the report. The GENERAL CONTRACTOR shall verify that all items on each inspection report have been addressed by their subcontractors in this time period. Once verified the GENERAL CONTRACTOR shall sign-off on each deficiency listed on the report and return the signed-off copy of the inspection report to LTY via e-mail. After the signed-off report is returned to LTY, the GENERAL CONTRACTOR shall request a re-inspection by LTY to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, LTY reserves the right to re-inspect whenever our schedule allows, with these re-inspections still being subject to Paragraph E below.

E. TEST REJECTIONS AND RE-INSPECTIONS: If a test is rejected or a re-inspection of an issued LTY Inspection Report is found to NOT be completely addressed, only ONE (1) additional inspection will be permitted without the Contractor incurring charges for each additional inspection required. LTY shall be reimbursed $500 by the GENERAL CONTRACTOR for

expenses in connection with EACH inspection in addition to the two (2) inspections allowed.

F. GOVERNMENTAL INSPECTIONS: Contractor shall test and demonstrate systems, allow for LTY and Owner inspections, and correct all punch list items before arranging for inspections from the Fire Marshall or other final “Certificate of Occupancy” inspection requirements. This will require that the contractor complete systems in a timely manner to meet construction schedules.

1.24 CONSTRUCTION PHASING

A. Phasing of construction shall be the sole responsibility of the General Contractor. Construction phasing shall accommodate all needs and schedules required by the Owner. All cost for construction shall be included in the price submitted by the Contractor on the bid date. No additional money will be approved for the Contractor or their sub-contractors to accommodate costs (including labor) associated with construction phasing.

END OF SECTION 26 00 00

SECTION 26 00 05
ELECTRICAL OPERATION AND MAINTENANCE MANUAL

PART 1 - GENERAL

1.01 ELECTRICAL OPERATION AND MAINTENANCE MANUAL

A. 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

        5) 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.

B. 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

1) As installed color coded piping diagrams.

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 26 00 05

SECTION 26 01 00
COORDINATION DRAWINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical.

PART 2 – REQUIREMENTS

2.01 COORDINATION DRAWINGS

A. The Mechanical Contractor shall take the lead in coordinating the Mechanical (HVAC), Electrical, Plumbing and Fire Protection Systems within the building.

B. The Mechanical Contractor shall coordinate a three-dimensional (3-D) model of the building which includes the Mechanical (HVAC), Electrical, Plumbing and Fire Protection Systems. The Electrical, Plumbing and Fire Protection Contractors shall prepare their work and generate 3-D models which will be given to the Mechanical Contractor for coordination. The Contractor will be provided with the REVIT model that was used to generate the contract documents. This file may be used as the background file. The Contractor shall replace the systems drawn with the actual shop drawing models. The Contractor is not limited to using REVIT but may use any 3-D software in generating and combining the coordination model. If an alternate software is used, all contractors must agree to provide compatible software models.

C. Submitting the contract drawings as coordination drawings will not be acceptable.

D. The model shall include detailed and accurate representations of all equipment to be installed based upon the reviewed equipment submittals.

E. The Mechanical Contractor shall hold a 3-D coordination meeting with all sub-contractors present to review the model and discuss coordination of the installation of the building systems.

F. Upon completion of the coordination meeting, the Contractor shall submit the 3-D model and 1/4” scale drawings for review.

G. The model shall detail major elements, components, and systems in relationship with other systems, installations and building components. Indicate locations where space is limited for installation and access, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. Indicate the proposed locations of pipe, duct, equipment, and other materials. Include the following:

a. Wall and type locations

b. Clearances for installing and maintaining insulation.

c. Locations of light fixtures and sprinkler heads.

d. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.

e. Equipment connections and support details.

f. Exterior wall and foundation penetrations.

g. Routing of storm and sanitary sewer piping.

h. Fire-rated wall and floor penetrations

i. Sizes and locations of required concrete pads and bases.

j. Valve stem movement.

k. Structural floor, wall and roof opening sizes and details.

2. Indicate scheduling, sequencing, movement and positioning of large equipment in the building during construction.

3. Prepare floor plans, elevations, and details to indicated penetrations in floors, walls and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air distribution devices, light fixtures, communication systems components and other ceiling mounted items.

H. Sequence of Coordination

1. Below is hierarchy of model elements and the sequencing by which the models will be coordinated:

a. Structural and Architectural Model

b. Miscellaneous steel

c. Perform preliminary space allocation.

d. Identify hard constraints (locations of access panels, lights, A/V space requirements, etc.

e. Main and medium pressure ducts from the shaft out

f. Main graded plumbing lines and vents.

g. Sprinkler mains and branches

h. Cold and hot water mains and branches

i. Lighting fixtures and plumbing branches

j. Smaller sized ducts and flex ducts

k. Smaller size cold water and hot water piping, flex ducts, etc.

I. The Contractor and Sub-Contractors shall not install any item until the coordination has been completed and reviewed by the Construction Manager, Owner and A/E Team.

J. This Contractor shall be responsible for coordination of all items that will affect the installation of the work of this Division. This coordination shall include but not be limited to: ampacity, capacity, electrical and piping connections, space requirements, system construction, building requirements and special conditions.

K. By submitting shop drawings on the project, this Contractor is indicating that all necessary coordination has been completed and that the systems, products and equipment submitted can be installed in the building and will operate as specified and intended, in full coordination with all other Contractors and Subcontractors.

END OF SECTION 26 01 00

SECTION 26 05 00
ELECTRICAL WIRING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 GENERAL INSTALLATION REQUIREMENTS

A. All electrical work dealing with electrical circuits or power requirements of 50 volts or higher shall be performed by a licensed journeyman electrician supervised by an on-site master electrician.

B. All cables not installed in conduit shall be plenum rated.

C. All conductors and cable shall be properly labeled at both ends and at any intermediate splice.

D. All low voltage cables shall be installed in continuous length without splice.

E. All plenum rated cables above accessible ceilings shall be supported from and near structure with nylon straps or D-rings. Do not weave through joists for support. All exposed cabling and cabling above inaccessible ceilings shall be installed in raceway.

F. Install conduit sleeves for all masonry penetrations of plenum rated cables.

G. In areas of remodeling, remove all conduit and wire that is not to be reused.

H. Provide grounding bushings for all connections at concentric and eccentric knockouts, and where reducing washers are used.

I. All junction boxes and other devices above ceiling that may require maintenance shall be located at least 8" and no higher than 18" above the ceiling.

J. All exterior junction boxes in the ground shall be concrete type with traffic rated tops.

K. Junction box covers and junction box shall be labeled with circuit numbers and relay numbers of wiring within the box. Circuit labels shall be readable from the floor level without removing the cover. Junction boxes, including covers, shall be color coded by voltage. Color code as follows: 120/208/240V – Light Green, 240V – Blue, 277/480V – Yellow, HVAC Controls and Power – Light Blue, Fire Alarm and Emergency Circuits – Red, Solar Photovoltaic Systems - Orange. Paint colors shall be light enough to ensure that the circuit numbers can be easily distinguished.

L. General Contractor shall coordinate with Electrical Contractor and Low Voltage Subcontractors that all conduits, J-boxes, sleeves and 120V circuit under all sections in Divisions 26, 27 & 28 shall be provided and installed by Division 26 Electrical Contractor under the base proposal pricing – No exception. General Contractor and Division 26 Electrical Contractor shall coordinate with Division 27 & 28 Contractors for locations of conduits, j-boxes, sleeves and 120V circuits prior to rough-in.

M. 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 “spare” and include panel identification. Example “Spare Panel LA”. Unused raceways not in sight of panel shall be terminated in a box and labeled “spare” and include panel identification. J-boxes serving light fixtures thru a wall mounted GTD are to have covers labeled with both normal and emergency panel and circuit ID.

N. Do not mount boxes, gutters, or conduit bodies on walls directly above electrical panels or switchgear located next to walls. Do not mount boxes, gutters or conduit bodies directly above panels or switchgear when mounted away from walls.

O. Do not mount boxes, gutters or conduit bodies within 18 inches of outside edges of roof access openings.

P. Support boxes to structure independently of conduit. Support systems are to hang straight down. All-thread supports, when used, are not to be installed at an angle or bent. Struts used for box or conduit hangers or supports shall be 1.625-inch minimum.

Q. Use plaster rings on gang boxes for devices. Use proper size plaster ring to ensure front of ring is within 1/8 inch of finished surface.

R. No more than 12 conduits containing branch circuits may be installed in any junction box or pull box.

S. Boxes are to be protected from building finish painter’s overspray; i.e. – mechanical rooms. Boxes are to be protected from fire proofing overspray. If unprotected they are to be cleaned and repainted.

T. Junction boxes are to be installed in same room, corridor, etc. as devices it will serve such as receptacles and switches. Only exception will be inaccessible areas such as hard ceilings in which case they are to be installed in nearest accessible corridor area. If corridor area is not preferred, contact PISD electrical representative for variance.

U. Use proper size box. Box extenders or plaster rings shall not be used to increase size for electrical wiring.

V. Bottom of boxes when mounted on walls are to be minimum of 4 inches above the top of sides of cable tray. No part of a box shall be below top of tray when both the box and tray are secured to a wall.

W. Adjust flush-mounting outlets to make front flush with finished wall material.

X. Install knockout closures in unused box openings.

1.03 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.

PART 2 – MATERIALS AND METHODS

2.01 RACEWAY SYSTEMS

A. REQUIRED: Complete raceway systems for all wiring. This includes, but is not limited to feeders, branch circuit wiring, temperature controls wiring, data cabling, video cabling, sound system wiring, security/CCTV/access control systems and fire alarm system wiring. Generally auxiliary system and controls wiring is plenum rated so conduit system would consist of junction boxes and conduit in walls or above inaccessible ceilings only. Control and interlock wiring shall be provided under the Mechanical Section. Note that the access control system requires conduit from door frame card readers to a junction box above an accessible ceiling that is no more than 10 feet high.

B. RACEWAY CAPACITY: It shall be the Contractor's responsibility to determine the correct sizes of all types of raceway, to be installed, as instructed in the NEC and all applicable Codes. Runs of underground conduit longer than 80 feet shall be one size larger than NEC requirement, 4" maximum.

C. INSTALLATION:

1. LOCATION: Conceal all raceway systems in ceilings, walls, and floors, except feeders serving equipment in mechanical and electrical equipment rooms, and in such other areas as indicated where conduit may be exposed. Keep at least 8" away from any heat producing items. Do not install conduit below grade or in floor slabs unless there is no other way to conceal conduit. Equipment feeders in mechanical rooms or mechanical

yards shall be run above grade. Major feeders from switchboard to distribution panels containing 4/0 or larger wire may be run underground. Do not install conduit on roof unless specifically shown to be on the roof or authorized in writing by the Engineer. All junction and pull boxes above accessible ceilings shall be mounted so that the access panel is no higher than 18” above the ceiling and accessible.

2. ROUTING: Conduit shall be installed parallel and perpendicular to building coordinates, except for underground feeders from panel to panel may be installed in the most direct manner. Install all horizontal conduit at structure unless mounted to a wall.

3. EXPOSED RACEWAY: Run parallel and perpendicular to walls, ceiling, or structural members, in a manner to present a neat appearance. Before installation, explain to the Inspector the proposed method of routing and obtain his approval. Hold all horizontal conduit at ceiling or structure, unless mounted on wall. No conduit penetration on the top or on the side of any interior or exterior VFD starter. All penetrations for VFD starter shall be from the bottom. Heavy Duty Disconnect Switches can be penetrated form top or side.

4. SUPPORT: Provide adequate and sturdy support for all parts of raceway system. Conduit concealed in walls or slabs may be supported with wire hangers, provided they are of heavy gage and spaced to give adequate strength. Exposed conduit must be supported with materials specifically made for this purpose; do not use wire hangers. Do not attach any parts of raceway system to air conditioning ducts or ceiling systems. Wiring above ceiling without conduit shall be supported from structure with J hooks. Unless described by detail on the drawings, provide Tolco Pipe Pier Supports four feet on center to support conduit on the roof. Select for proper weight loading.

5. CONTINUITY: Make all joints and connections in a manner which will insure mechanical strength and electrical continuity. Use double locknuts and insulated bushings for rigid conduit, and insulated type connectors for EMT conduit 1” and larger for connections to boxes. Use insulated grounding bushings wherever connection is subject to vibration or moisture, such as near mechanical equipment, when internal ground wire is installed, and when concentric or eccentric knockouts are encountered, as well as where reducing washers are used.

6. PULL BOXES: As required by the National Electrical Code.

7. EXPANSION FITTINGS: Install O. Z. or equal expansion fitting in each run of conduit which crosses building expansion joint, and in all runs longer than 200 feet.

8. CORROSION PROTECTION: For all non-coated metal raceway in contact with concrete or mortar, tape with 3M corrosion protective tape, or equal. Tape shall extend for approximately 6" before entering and after exiting concrete.

9. PULL WIRE: Install nylon pull cord in all empty electrical power raceway systems.

10. OPENINGS: Keep all raceway openings closed in a manner to prevent entry of moisture and foreign materials until conductors are installed.

11. FIRE PROOFING: All power and technology raceway components passing through or installed within U. L. fire rated walls, ceiling or floor structures shall be fireproofed in the manner prescribed by the U. L. Fire Resistive Index and local building codes. All

penetrations shall be fireproofed with 3M Fire Barrier CP25WB caulk, moldable putty or FS-195 wrap/strip installed per the manufacturer's recommendations.

12. SEALING: All conduit, junction box, outlet box and other penetrations of the building envelop shall be sealed with non-hardening caulking or other non-hardening material as required by the International Energy Conservation Code.

13. Provide steel sleeves for conduit or cable penetrations through fire rated walls and partitions.

D. MANUFACTURERS: All components of raceway systems must be made in U.S.A. and bear U. L. label.

2.02 CONDUIT

A. See conduit specification for additional information.

B. CONDUIT TYPES

1. RIGID GALVANIZED STEEL – Threaded fittings

2. PVC COATED RIGID GALVANIZED STEEL - Plasti-Bond REDH2OT with ETL Verified PVC-001 label or equal with ETL label. Provide Plasti-Bond coated couplings, fittings and pulling elbows.

3. PVC CONDUIT – Schedule 80.

4. EMT – Steel conduit with steel, insulated throat connectors & set screw fittings. Provide insulated throat watertight fittings where conduit is exposed to dampness inside building.

5. FLEXIBLE METAL CONDUIT – Greenfield, galvanized steel conduit for field installation of conductors (maximum 24”) (light fixtures up to 72”), Only for light fixture whip.

6. LIQUID TIGHT FLEXIBLE METAL CONDUIT – SealTite Type UA galvanized steel conduit with PVC waterproof coating for field installation of conductors (maximum 24” long except light fixtures up to 72”)

7. CABLE TRAYS – Cooper B-Line 36 Series aluminum, ladder type cable tray with 9” rung spacing. Width based on application. Support per manufacturer’s recommendations.

C. TYPE OF CONDUIT FOR VARIOUS LOCATIONS:

1. UNDERGROUND: Schedule 80 PVC. Install PVC coated, rigid galvanized steel, long radius elbows underground. PVC coated, rigid galvanized steel, long radius elbows where conduit turns up to grade shall extend a minimum of 2” above the grade or concrete slab and, where unobstructed, extend 18" above grade or concrete slab. If obstructed, PVC coated, rigid galvanized steel, long radius elbows where conduit turns up to grade shall extend as far above grade or concrete slab as possible prior to obstruction, up to 18". Encase underground conduit not under building slab in a 3" red concrete envelope located a minimum of 36” below grade. Install red tracer tape (Magnetic marking) on top of red concrete. Notify Inspector for inspection of duct bank at

least 24 hours prior to concrete placement. Conduit below building slab or conduit for technology, data, etc. do not require concrete encasement. Top of red concrete shall be 36" below grade. top of conduit shall be 39" below grade. Provide minimum 2' separation of power and data conduits at parallel paths.

2. IN POURED CONCRETE WALLS: PVC coated, rigid galvanized steel or Schedule 80 PVC. Install PVC coated rigid steel fittings on PVC conduit prior to conduit exiting concrete.

3. IN MASONRY WALLS: Galvanized steel EMT with steel, set screw fittings.

4. EXPOSED OUTSIDE OF BUILDING: Rigid galvanized steel. For conduit in mechanical courtyard within 50 feet of a cooling tower provide PVC coated, rigid galvanized steel conduit and fittings.

5. INSIDE OF BUILDING IN CEILING CAVITIES, IN EXPOSED FLOOR OR ROOF STRUCTURE AREAS, OR IN DRY WALL TYPE CONSTRUCTION: Galvanized steel EMT or rigid galvanized steel.

6. IN CONCRETE SLABS: Do not install conduit in concrete slabs.

7. FLEXIBLE METAL CONDUIT CONNECTIONS: Use only for connection to motors and transformers from rigid conduit system. Do not loop flexible conduit between light fixtures or receptacles. Provide liquid tight construction and fittings in wet, damp or outside areas. Connections to mechanical equipment in main mechanical or boiler room, and kitchen equipment shall be in liquid tight. Do not install inside an air handling unit room. Minimum length shall be 18”. Maximum length shall be two feet except light fixture whips may be up to six feet.

8. LIGHT FIXTURE WHIPS: Flexable metal conduit not to exceed six feet in length. Light fixture whip from J-box and EMT or rigid conduit. Do not loop light fixtures and electrical devices with flexable metal conduit cable.

9. Contractor must comply with City Code of Ordinances. Electrical metallic tubing or rigid conduit shall be used for all circuits in commercial buildings. Metal-clad cable (type MC cable) may be used for retro fits or remodels up to ten feet and light whips up to six feet. Armored cable (type AC cable) (BX) is not allowed.

D. MINIMUM CONDUIT SIZE: 3/4"

E. FITTINGS:

1. RIGID CONDUIT: All rigid galvanized steel conduit shall have rain-tight threaded fittings with insulated bushings.

2. EMT CONDUIT: Provide steel, insulated throat connectors & set screw fittings. Provide liquid tight where conduit is exposed to dampness inside building.

3. GROUNDING: Provide fitting with grounding lug where conduit attaches to a painted box (disconnect switch, starter, transformer case, etc), conduit attaches to a box through a knockout which has an associated larger knockout or a reducing washer is used, or

conduit contains a feeder from switchgear to switchgear or between switchgear and transformer.

4. TELEPHONE AND DATA CONDUIT: Provide protective bushing on the end of technology, data, sound system or other conduit stubbed into the ceiling cavity.

   a. For outlets with 3 or less cables / data drops, use (1) 1” EMT conduit.

   b. For outlets with 3-6 cables / data drops, use (1) 1.25” EMT conduit.

   c. For all other sizes, calculate fill ration at 40% for proper sized conduit.

F. SPARE CONDUIT: Provide five empty 1” conduit from all recessed electrical panels to above the nearest accessible ceiling.

G. LOW VOLTAGE CONDUCTORS: Low voltage conductors may be run in accessible ceilings without conduit. Provide conduit sleeve with protective end fittings through all walls and floors where raceway system is not installed. All exposed conductors shall be in conduit. All splices shall be in supported junction boxes. Low voltage conductors installed without conduit shall be independently supported on ring hangers, and plenum rated. Low voltage conductors for audio and data wiring shall be stranded unless otherwise recommended by the manufacturer.

2.03 PULL BOXES

A. REQUIRED: Pull boxes, junction boxes, wiring troughs and cabinets wherever required for proper installation of various electrical systems.

B. CONSTRUCTION: Made of code gage steel with sides formed and welded, screw covers unless shown to have hinged doors. Hinged doors to be same as furnished on panel boards, with same locking device. Knockouts shall be factory made or formed in field with a cutting tool which will provide a clean, symmetrically cut hole. Do not gang boxes or use extension rings to increase capacity.

2.04 ELECTRICAL GUTTERS AND WIREWAYS

A. QUALITY ASSURANCE

1. UL Label: Gutters and wireways shall be UL labeled.

B. ELECTRICAL GUTTERS AND WIREWAYS

1. General

   a. For interior of building applications provide galvanized steel gutters and wireways in the type and sizes indicated or required, minimum 16 gauge thickness, with rounded edges and smooth surface; with features required.

   b. For exterior of building applications provide NEMA 4X stainless steel gutters and wireways in the type and sizes indicated or required.

2. Size: Provide size indicated.

a. Where size is not indicated, construct in accordance with the NEC and other standards.

b. Gutters shall be of manufacturer’s standard lengths, without field cutting or field extensions.

3. Accessories: Provide gutter and wireway accessories where indicated, constructed of same metal and finish as gutters or wireways.

4. 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.

5. Materials and Finishes:

a. NEMA 1 gutters and wireways shall have gray powder coat finish over galvanized steel.

b. Gutters and wireways installed exterior of building, in kitchen or food preparation areas, or inside natatorium areas shall be 304 stainless steel NEMA 4X construction.

C. INSTALLATION

1. Provide gutters and wireways only where specified or required. Use of gutters and wireways shall be kept to a minimum.

2. Finishing: Remove burrs and sharp edges of gutters and wireways wherever they could be injurious to conductor insulation or jacket.

3. 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.

4. Grounding: Electrically ground gutters and wireways to ensure continuous electrical conductivity. Provide equipment grounding conductor.

5. Conductors:

a. Complete gutter and wireway installation before starting the installation of conductors.

b. Provide sufficient space to permit access for installing, splicing, and maintaining the conductors.

6. A maximum of 12 conduits containing branch circuits shall be allowed to be installed in any gutter or wireway.

7. Gutters installed in areas accessible to public and below 9 feet are not to have stamped knockouts.

8. Gutters are to be painted and labeled according to contents

2.05 OUTLET BOXES

A. REQUIRED: For all switches, light fixtures, receptacles, and the various other outlets shown.

B. CONSTRUCTION: Galvanized steel, one-piece construction, in all cases suitable for intended use.

1. Provide "gang" boxes where devices are shown grouped.

2. Use hot dipped galvanized cast iron for floors or exterior locations.

3. Damp / Wet Outlet and Switch Boxes: Deep type hot dipped galvanized cast-metal weatherproof outlet box (Bell box type).

4. For Exterior or Wet Areas; 304 stainless steel NEMA 4X with gaskets and corrosion resistant fasteners.

C. TYPES FOR VARIOUS LOCATIONS:

1. CEILINGS: 4" square, 2-1/8" deep.

2. DRY WALLS: 4" square, 2-1/8" deep standard galvanized switch box. Provide shallow boxes where necessary. Provide tab to align box with studs.

3. MASONRY WALLS: Galvanized switch boxes designed especially for masonry installations. Depths of boxes must be properly coordinated for each specific installation. Box shall be installed within 1/8” of surface of block.

4. FLOOR: Watertight, adjustable, cast iron.

5. SURFACE MOUNTED: Boxes surface mounted on walls or floor shall be Bell, cast aluminum box with appropriate plate and threaded hubs.

6. BACK-TO-BACK OUTLETS: Outlets shown back-to-back on the drawings are to be installed with a minimum of 6" of lateral separation between outlets and with stud separtion for minimum sound transmission. Provide minimum 24" with separation in acoustic rated walls. "Through-the-wall" type boxes are not permitted.

7. TECHNOLOGY: Data/AV boxes 4 11/16" square with 1-1/4" knockouts, 3 inch deep.

8. Gym Motorized Basketball Goal Switch Box: 2 gang 4-inch square required per switch.

9. Corrosive locations or natatorium areas: 304 stainless steel construction suitable for the installation.

10. Recessed wall mounted box for power and/or multi-media outlets for interactive boards or other similar applications shall be Arlington Industries, Model #TVBS613. If indicated on drawings.

D. MOUNTING PLATES: Boxes mounted in drywall construction shall have extension plates matched to wall thickness so the box can be mounted flush with the metal stud and the wiring device mounts flush with the wall.

2.06 CONDUCTORS

A. REQUIRED: A complete system of conductors in all raceway systems except where shown otherwise. No conductors are to be installed in technology conduit. Emergency or exit circuitry shall be installed in a separate raceway system.

B. BUILDING WIRE: 600 Volt, soft drawn annealed copper, 98% conductivity, continuous from outlet to outlet. Minimum wire size #12 except remote control wire may be #14. All wire shall be stranded Type THHN, THW-2 or THWN-2 (wet rated for 90□ C). All wires shall be color coded with same color connected to same ungrounded phase throughout the installation.

C. BURIED GROUND WIRE: Conductors used to interconnect ground rods of a grounding triad or supplemental ground loop shall be minimum #2, bare, tinned, solid copper wire. Connect this wire to rod with short length of same wire, thermo-welded to loop and rod.

D. MANUFACTURERS: Cerro, Encore, Republic, Triangle, Southwire Co. and United

E. CONNECTORS: Make all connections on #10 and smaller wire with Code approved solderless pressure type insulated connectors; Ideal Wingnut. Solderless lugs must be used for all terminations.

F. TEST: After installation of all conductors, and before final acceptance, make such tests as are required to determine proper functioning of all circuits. Furnish all necessary instruments required to make such tests and correct any deficiencies found.

2.07 CONNECTIONS TO MOTORS, EQUIPMENT AND DEVICES

A. POWER WIRING: Make wiring connections to all mechanical, plumbing and other equipment being installed as a part of this Contract. In addition, make connections to Owner furnished equipment as shown.

B. CONTROL WIRING: Control and interlock wiring for HVAC Systems will be provided by the Mechanical Contractor. Motorized dampers of the same voltage as the associated fan shall be wired by the electrical contractor when the damper is in close proximity to the fan. Under this section provide a 20-amp, 120-volt circuit to the control panel in each mechanical room from the local low voltage panel.

C. CONNECTIONS TO EQUIPMENT: Make connection to each motor and to each piece of equipment subject to vibration with not less than 18" nor more than 24” of flexible conduit. All horizontal runs of conduit (not strapped to walls) must be kept above 7 feet high, with a vertical drop to equipment. Conduit blocking walk and service space is not acceptable and will require relocation. Conduit on and adjacent to equipment must be located to allow free access to all removable panels for equipment service. Wire adjacent to heat producing equipment, such as boilers and electric heaters, must be of a type approved for this use.

D. CONNECTIONS TO TRANSFORMERS: Install not less than 18" nor more than 24” of flexible conduit at each connection to floor mounted transformers.

E. CONNECTIONS TO RECEPTACLES: All multiple devices on a circuit such as receptacles shall be back wired with pigtail so device does not provide continuity path.

F. MOTORS 10HP OR GREATER: Shall be provided with Tyco Gelcap motor connector kit or other listed insulated mutli-tap connection. Wire nuts are not acceptable. Provide copper alloy, split bolt connectors with rubber and electrical tape.

2.08 CIRCUITRY

A. The intent of the drawings is to indicate schematically the circuitry required.

B. 20-amp, single phase branch circuits serving lighting and general receptacles may be grouped in a single raceway provided a neutral conductor is installed for each circuit requiring a neutral. Do not install more than four current carrying conductors in a conduit except nine #12 or #10 conductors may be installed in 3/4" or larger conduit. Segregate data processing circuits and stage dimming circuits from other types of circuits. Do not install 480/277-volt conductors in the same conduit with 208/120-volt conductors.

C. The work performed in grouping conductors in a single raceway shall comply with all applicable articles in the latest edition of the NEC and Local Codes which shall include, but shall not be limited to, ampacity de-rating of conductors and maximum capacities of raceways.

2.09 POWER CONDUCTOR COLOR CODING

A. 480/277 VOLT SYSTEM: Conductors shall have insulation of the proper color as listed below:

Phase A	- Brown
Phase B	- Purple
Phase C	- Yellow
Neutral	- Natural Gray
Ground	- Green
Isolated Ground	- Green w/ yellow stripe

B. 208Y/120 VOLT SYSTEM: Conductors shall have insulation of the proper color listed below:

Phase A	- Black
Phase B	- Red
Phase C	- Blue
Neutral	- White
Ground	- Green
Isolated Ground	- Green w/ yellow stripe

C. 240/120 VOLT DELTA SYSTEMS:

Phase A	- Black
Phase B	- Orange (high leg of delta)
Phase C	- Blue
Neutral	- White w/ colored stripe

Ground - Green
Isolated Ground - Green w/ yellow stripe

D. Contractor may use colored tape marking for size 8 and larger phase and neutral conductors, and size 4 and larger ground conductors.

E. Switch legs are to be color coded the same as the un-switched phase, i.e., all wiring from lighting control panels and contactors shall retain the phase color.

F. If existing construction has a consistent but different color coding, match existing.

2.10 SPECIAL SYSTEMS CABLE COLOR CODING

A.	Fire Alarm	Red
B.	P/A Communications	White
C.	Misc Low Voltage/Sound	Gray
D.	Data Cabling	Blue
E.	Data WAP's Cabling	Orange
F.	Fiber Optics	Black installed in Orange inner duct
G.	Fiber Patch Cables	Orange
H.	Security Wiring	Purple
I.	BMCS (EMS)	Yellow (varying shades of Yellow for trouble shooting)
J.	Voice	Green

2.11 SURFACE MOUNTED RACEWAY

A. Classification and Use:

1. 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.

B. Acceptable Manufacturer

1. Wiremold

END OF SECTION 26 05 00

SECTION 26 05 05
ELECTRICAL ALTERATIONS PROJECT PROCEDURES

PART 1 - GENERAL

1.01 MATERIALS AND EQUIPMENT

A. Material used to upgrade and repair existing equipment shall conform to that specified.

1.02 INSPECTION

A. Verify that abandoned wiring, panelboards, and switchboards, disconnect switches, and equipment serve only abandoned facilities. Where abandoned wiring, panelboards, switchboards, and equipment which serve existing facilities are to remain, Contractor shall provide means and methods to ensure existing facilities remain energized with the correct voltage, overcurrent protection, conductors, and circuit ampacity required by the existing facilities to remain.

1.03 APPLICATION

A. 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.

B. 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.

C. Panelboards Reused and Modified for Renovation: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

1.04 SEQUENCING AND SCHEDULING

A. 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.

B. Remove and replace existing conduit wiring, outlets, devices, lighting fixtures, panels and appurtenances as occasioned by new or remodeled construction. Re-establish service to lights, switches and devices that may be interrupted by remodeled construction. Re-label junction boxes if circuit changes.

C. Verify the loading of each circuit affected by remodeling work. The maximum load of any branch circuit shall not exceed 80% of its rating.bv

D. Remove equipment, systems, conductors, wiring, raceways, etc. abandoned or not required for existing or new systems. Coordinate with Architect / Owner for salvage by Owner. Remove abandoned / not required raceways and wiring back to nearest box serving load to remain, or back to panel if not serving remaining load.

1.05 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL 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.

B. 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.

C. Disconnect and remove abandoned panelboards and distribution equipment.

D. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

E. Disconnect and remove abandoned luminaries. Remove brackets, stems, hangers, and other accessories.

F. Maintain access to existing electrical installations that remain active.

1.06 IDENTIFICATION OF EQUIPMENT IN RENOVATED AREAS

A. identification of Equipment: Provide new, typed panel directory cards (and card holders if needed) for existing panelboards located within the renovated areas. Do not include the description "existing". Provide new nameplates for all existing electrical equipment in renovated areas as specified in Section 26 05 00 Electrical General Provisions.

END OF SECTION 26 05 05

SECTION 26 05 26
GROUNDING AND BONDING ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 – MATERIALS AND METHODS

2.01 CONDUCTORS

A. REQUIRED: A complete system of ground wires in all raceway systems except where shown otherwise.

B. BUILDING WIRE: 600 Volt, soft drawn annealed copper, 98% conductivity, continuous from outlet to outlet. Minimum wire size #12 except remote control wire may be #14. All wire shall be stranded Type THHN, THW-2 or THWN-2 (wet rated for 90□ C). All ground wires shall have green color insulation. Large conductors may have green tape marking at each end.

C. BURIED GROUND WIRE: Conductors used to interconnect ground rods of a grounding triad or supplemental ground loop shall be minimum #2/0, bare, tinned, solid copper wire. Connect this wire to rod with short length of same wire, thermo-welded to loop and rod.

D. MANUFACTURERS: Cerro, Encore, Republic, Triangle, Southwire Co. and United.

2.02 GROUNDING

A. GENERAL: Permanently and securely ground the mechanical and plumbing equipment and piping systems, conduit system, panel boards and all other components of the electrical system installed or connected by the Sub-contractor. Follow NEC and building code requirements.

B. CIRCUIT GROUNDS: Provide a green ground wire sized per the NEC for every circuit.

C. EQUIPMENT ENCLOSURES: Make firm ground to raceway system. Equipment connected with flexible conduit or sealtite, shall have the specified ground wire installed inside conduit. Do not wrap on the outside of the conduit.

D. TRANSFORMERS: Each transformer shall have its enclosure and secondary neutral terminal (except when a neutral terminal does not exist) bonded to the building steel and local, driven ground rod.

E. SYSTEM GROUND: Ground system neutral in-service entrance equipment to the building steel and three 3/4" x 10-foot, copper clad, driven ground rods. Install ground rods outside in an equilateral triangle pattern, 10 feet on a side, with rod tops 12” below grade. Connect ground wire from rod to rod in a complete loop then extend to service equipment. Use cadweld connections below grade. Refer to drawings.

F. DATA SYSTEM GROUNDING: At each MDF and IDF provide a 24”x3”x1/4” copper ground bar mounted to the wall with isolating standoffs. Provide eight lugs for connecting ground wires up to #6 AWG. Ground the IDF Room bars to the MDF ground bar with #6 AWG daisy chained from bar to bar. Ground the MDF ground bar to the service ground bar in the main switchboard with #6 AWG.

G. ELECTROMAGNETIC SHIELDING: In rooms painted with EMI shielding paint provide grounding system between the painted walls and the local ground bar. These areas include MDF and IDF rooms. Provide Ground-Connection-Set ESK manufactured by Less-EMF Inc. Kit consists of a plate mounted to the wall, with a continuous Conductive Tape extending from the ground bar and attached each wall completely around the room. The mounting plate shall be electrically connected to the room ground bar with the included cable. Refer to manufacturer’s instructions for complete details of the installation.

H. GROUND WIRE CONDUIT: Conduit containing a ground wire shall be grounded at each end to the ground wire.

I. TELEPHONE GROUND: Install a #6 ground wire from the telephone board to the MDF ground bar.

J. SOUND SYSTEM GROUND: Install a #6 ground wire from the amplifier equipment to the ground bar in the Service Entrance Equipment.

K. Make grounding connections using ground clamps, connectors or exothermic welds UL approved for the application. Use of beam clamps for grounding is not acceptable.

L. DATA / VOICE COMMUNICATIONS CLOSET GROUND BAR:

1. MDF closets/head end rooms: Erico Cadweld #B544A027 ground bar.

2. IDF closets: Erico Cadweld #B542A004 ground bar.

Note: Refer to technology drawings for size, type, location and quanity.

2.03 MISCELLANEOUS REQUIREMENTS

A. 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. Provide #6 ground conductor from telephone/voice/CATV/data company demarcation point to building electrical service entrance ground electrode connection and as required by all local utility companies.

1. MDF Closetes Telecommunications Main Ground Bar (TMGB): Provide Erico Cadweld #B544A027 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 elecrical switchboard or panelboard. Ground conductor is to be installed in conduit system not containing other conductors. J-boxes if needed are to be labeled as MDF Ground and not painted.

2. IDF Closetes Telecommunications Ground Bar (TG3): Provide Erico Cadweld #BB542A004 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. Ground conductor is to be installed in conduit system not containing other conductors. J-boxes if needed are to be labeled as IDF Ground and not painted.

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 together and with #6 AWG insulated ground conductor to the local TMGB / TGB.

6. Route TMGB – TGB ground conductor using the shortest, straightest, route practical with long radius curves.

PART 3 – INSTALLATION

3.01 ELECTRICAL SYSTEM GROUND TESTING:

A. The resistance of the grounding system to ground shall not exceed 3 ohms for water pipe ground or 6 ohms for driven ground rods. If tests indicate a higher value, additional ground rods shall be installed to reduce the resistance to a value of 6 ohms or less. Whenever connection is required to an existing ground conductor, tests shall be made before connection to ensure that the existing ground conductor is unbroken and continuous. Ground tests shall be performed after at least 7 days of dry weather with test meter supplying a minimum of 50 amps to the ground rod. Auxiliary current electrode shall be approximately 85 feet from ground rod and auxiliary potential electrode shall be 62% of this distance from the ground rod in between the two rods.

END OF SECTION 26 05 26

SECTION 26 05 33
CONDUIT SYSTEMS

PART 1 - GENERAL

1.01 ACCEPTABLE MANUFACTURERS

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

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

C. Stainless Steel fittings: Robroy, Calbrite, Gibson, Crouse Hinds

1. Aluminum fittings: Penn Aluminum, American Conduit, Wheatland, Eaton B-Line, Patriot Aluminum Products

2. Reinforced Thermosetting Resin Conduit (RTRC) fittings: FRE Composites, Champion Fiberglass

D. 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

E. 1/2" Flexible metal conduit for light fixture whips:

1. AFC

2. Southwire

3. General Cable

4. Kaf-Tech

1.02 GENERAL

A. The minimum conduit size shall be ¾-inch.

B. The minimum conduit size for Technology / Voice / Data / Video shall be 1-inch.

C. The minimum conduit size for flexible metallic conduit for tap connections to light fixtures and equipment shall be ½-inch, 6-foot maximum length.

D. Electrical nonmetallic tubing, flexible polyethylene or PVC tubing shall not be used.

E. BX, MC and AC cable shall not be used.

F. PVC elbows and fittings, except for threaded / slip-on / glue or straight conduit slip-on / glue fittings shall not be used.

G. Intermediate metal conduit (IMC) shall not be used.

H. LBD condulets shall be used for size 2 inch and above. 2 inch and above LL and LR condulets are not allowed.

I. RIGID STEEL CONDUIT

1. UL labeled, Schedule 40.

a. Mild steel pipe.

b. Zinc coated inside and out.

c. Threaded ends

d. Insulated bushings

2. Fittings shall meet the same requirements as rigid steel conduits.

a. UL labeled.

b. Threaded fittings

J. ELECTRICAL METALLIC TUBING (EMT)

1. UL labeled, standard weight.

a. Cold rolled steel tubing.

b. Zinc coated inside and out.

2. Fittings shall meet the same requirements as EMT conduits.

a. UL labeled

b. Steel Set Screw Fittings

c. Steel fittings with set screws with lock nuts on threaded ends, no snap locks.

d. Cast metal fittings are not approved.

e. Uni-couple type connectors are not approved.

f. Split ring, anti-short bushings are not approved.

g. Insulated throat connectors

K. PVC COATED RIGID STEEL WITH URETHANE INTERIOR COATING

1. UL Labeled Schedule 40 zinc coated with 40 mil thick PVC exterior coating, 2 mil thick urethane interior and thread coating, threaded ends.

2. Threaded fittings shall meet the same requirements as rigid steel conduits, with PVC exterior coating, urethane interior coating and UL Labeled.

3. Insulated Bushings

4. Touch-up compounds for interior urethane and exterior.

5. Manufacturer: Perma-cote; Plasti-Bond

L. ALUMINUM CONDUIT

1. UL Labeled

a. Threaded ends

b. Insulated bushings

2. Fittings shall meet the same requirements of aluminum conduits

a. UL Labeled

b. Threaded fittings

M. FLEXIBLE CONDUIT

1. Steel flexible metallic conduit.

a. Zinc coated inside and out.

b. 18-inches minimum length, 72-inches maximum length

2. Steel flexible metallic conduit for tap connections to light fixtures and equipment.

a. 18 inches minimum length; 6 feet maximum length

3. Liquid tight flexible steel conduit.

a. Type L.A. - Grounded - UL Approved.

b. 18-inches minimum length, 6-feet maximum length

N. PVC CONDUIT

1. UL labeled Schedule 80.

2. PVC fittings and solvent welded joints.

O. ROOF MOUNTED CONDUIT AND BOX SUPPORTS

1. 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.

2. DD. Approved Manufacturer:

a. Cooper B-Line C-Port

1.03 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 structure and surfaces.

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 or flexible conduit to ceiling support wires.

5. Arrange conduit to maintain head room, minimum 6’6” above grade or finished floor, and present neat appearance.

6. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104° F.

7. Cut conduit square using saw or pipe cutter; de-burr cut ends.

8. Bring conduit to shoulder of fittings; fasten securely.

9. Use conduit hubs to fasten conduit to sides and tops of equipment, device, box, gutter, wireway, disconnect, etc. in damp and wet locations. This includes kitchen areas.

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 perpendicular or parallel to building lines.

14. Do not use no-thread couplings and connectors for galvanized steel, PVC coated rigid galvanized steel conduit, or aluminum rigid conduit.

15. Spare / future conduit risers penetrating up from grade or finished floor shall have threaded ends with suitable caps / plugs installed on ends.

16. Fittings for rigid galvanized steel conduit are not to be used in aluminum rigid conduit runs and vice-versa.

B. Group related conduits; support using conduit rack. Construct rack using 1.625-inch 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 nstalled on walls, partitions, and ceilings, raceways shall be blocked out proper distance to allow insulating material to pass without cutting or fitting. Also provide 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:

1. 120/208 volt circuits

2. 277/480 volt circuits

3. Emergency Circuits

    a. Life safety branch

    b. Critical branch

    c. Equipment branch

4. Voice/Data

5. Sound reinforcement / Theatrical and Architectural Dimming Controls

6. MATV/CATV

7. Security CCTV

8. Security System

9. Communications / PA Systems / Sound System Line Input and Speakers

10. Fire Alarm

11. HVAC Controls

12. Ground conductors from MDF, IDF ground bus bars to bar joist and panel/switchgear

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.

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 curbs where possible. 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. Exposed threads shall have minimum two-wraps of 3M-50 tape.

J. Conduit terminations at switchgear, panels, disconnects, HVAC equipment, pull boxes, outlet boxes, stub-up, and stub-outs, or where wire size is #4 or larger:

1. Provide insulated throat connectors for EMT conduits.

2. Provide insulated bushing on all rigid conduit terminations.

3. For all types of rigid conduits, provide locknuts inside and outside of all boxes and enclosures.

4. Provide threaded type bushings on conduit terminations at switchgear, disconnects, HVAC equipment, transformers, feeder conduit to panels, conduit nipples installed between multi-section panels, and where conductor size is #4 or larger.

K. In suspended ceilings, support conduit runs from the structure, not the ceiling system construction.

1. Do not support from structural bridging.

L. Do not support from metal roof deck.

M. Completely install each conduit run prior to pulling conductors. All boxes are to be accessible including 12-inch clearance in front of openings, 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. Hold horizontal and vertical conduits as close as possible to walls, ceilings and other elements of the building construction.

Q. Install all conduits perpendicular or parallel to building lines in a neat and workmanlike manner.

1. 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.

2. Where a piece of equipment is wired (electrical, control, low voltage) from a switch box, cabinet, etc. on adjacent wall, the conduit shall go up the wall, across at a minimum height of 6 feet-6-inches above finished floor and back down to the equipment. Conduits shall not block the space between wall and equipment below the 6 feet 6 inch minimum height requirement.

3. Horizontal runs of conduit on exposed walls shall be kept to a minimum.

4. Conduit for mechanical / plumbing equipment installed outdoors shall be routed with the associated mechanical / plumbing pipe support rack system where practical. Separate conduit supports systems, when required, shall be hot-dipped galvanized material for other than unistrut. Unistrut supports shall be aluminum, 1-5/8-inch minimum.

R. Conduits installed in public areas, not concealed by architectural ceilings, shall be supported by galvanized steel channel racks tight to bottom of roof deck or floor deck. Conduits shall be grouped for neat workman-like appearance.

1. Conduits in gyms are to be installed and supported to upper section of bar joist. They may be turned down to mount J-boxes on lower section of bar joist. Conduit systems are not to be installed running perpendicular on/under lower section of bar joist

S. Install expansion and deflection fittings and bonding jumpers where conduits cross building expansion joints.

T. Provide grounding bushings at concentric/eccentric knockouts or where reducing washers are used.

U. Run conduit to avoid proximity to heat producing equipment, piping, and flues, keeping a minimum of 8-inches clear.

V. 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.

W. 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.

X. 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.

Y. 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. Cut rod pendants maximum of one inch below nuts under channels. 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. Proper size channel shall be used to prevent bowing from weight of conduit systems Toggle bolt wing nuts to support channel or pendants 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 structural bridging or fire rated ceiling system. Do not support more than one conduit from a single all-thread rod support. All-thread support rods are to hang vertically and are not to be bent or installed at an angle. Provide electrical insulating sleeve or wrapping for aluminum conduit supported by zinc coated supports or fasteners. Channel supports shall have cut ends filed smooth. Channels are not to be cut for the purpose of bending. supports shall have cut ends filed smooth. Channels are not to be cut for the purpose of bending. When installed outside of the building, or in areas subject to moisture other than cooling towers, 1 5/8 inch aluminum channel shall be used. Aluminum conduit straps shall be used to support conduit to aluminum channel. Under certain conditions and with Owner approval, factory hot dipped galvanized channel (not zinc coated only) may be used outdoors. If used outdoors, the cut ends of galvanized channel are to be filed smooth and painted with ZRC galvanized paint. Galvanized/Aluminum channel shall not be secured to other channel, structure, equipment, etc., using self-tapping screws. Proper factory channel material, nuts, bolts, washers are to be used. Unistrut support systems are not to be constructed using self-tapping screws. Conduit straps are not to be secured to channel using self-tapping screws

Z. Flexible metal conduit shall be supported with #13 AWG galvanized iron wire pendants and "Caddy clips". The wire shall be secured to structure then at ceiling grid using Caddy drop wire securing clip, Part #EC311. Do not secure support wire from structural bridging, piping, other MEP work. Do not allow flexible metal conduit to rest on ceiling tile or grid. Flexible metal conduit shall not be longer than 6 feet and shall contain an equipment grounding conductor.

AA. Terminate all motor connection conduits in mechanical room spaces with a floor pedestal and with “Tee” conduit at motor outlet height for flexible conduit.

BB. Where conduit is not embedded in concrete or masonry, conduit shall be firmly secured by approved clamps, half-straps or hangers. Tie wire and pieces of conduit shall not be used as supports and or hangers.

CC. Where “LB” condulets are used, 2-inches and larger shall be type “LBD”.

DD. No more than 12 conduits containing branch circuits may be installed in junction boxes, pull boxes or gutters. Installing divider plates to achieve this requirement will not be acceptable.

EE. “Daisy Chaining” light fixtures installed in lay-in ceiling areas is not allowed. Each light fixture shall have its own fixture whip from junction box. The only exception will be light fixtures installed end to end using chase nipples between them. Recessed light fixture installed in inaccessible ceilings, i.e. hard ceilings, may be “daisy chained”. Any light fixture containing both a circuit from a normal source and an emergency source shall have a separate fixture whip for the emergency

circuit from the emergency junction box. Do not use non-emergency light fixtures as raceways for emergency circuit serving emergency light fixture.

FF. 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 and shall not exceed 6' in length. They shall not be used for wall or roof penetrations unless they are installed in PVC coated galvanized sleeve at least one size larger than the OD of the flexible conduit. Dedicated ground conductor is required.

GG. Where 3-1/2-inch conduit is specified and the required or specified material is Schedule 80 PVC, provide 4-inch conduit.

HH. 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.

II. Do not install conduit, junction boxes, etc. within 18 inches of outside edges of roof access openings.

JJ. Install minimum size 2 inch nipple, at least one, with bushings on ends, between multi-sectional panels for branch circuits independent of feeder conductors.

KK. Total degree of fittings not to exceed 270 for any conduit run. Provide additional pullboxes as required to accommodate. Additional maximum degrees noted for specification locations below.

1.04 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: Aluminum rigid conduit.

b. Where subject to physical damage: Rigid galvanized conduit.

c. Wet locations: PVC coated galvanized rigid steel

d. Damp Locations: Aluminum rigid conduit

B. Conduit run outside the building underground; conduit where indicated beneath the building slab:

1. PVC Coated Galvanized rigid steel conduits and PVC.

a. PVC conduit and fittings shall be used only for straight horizontal runs. Provide PVC coated rigid galvanized steel conduit and fittings at all changes in direction and at all vertical runs to 18 inches above finished floor, grade or slab. Only vertical PVC exception will be for pole light base risers. Bending PVC conduit or the use of PVC factory bends is not allowed.

b. Conduit for all floor boxes shall be routed below building slab from floor box to nearest column, wall, or as indicated.

c. Conduits shall not be routed in building slab or pavement.

d. Only conduits indicated as so on drawings are allowed to be routed under slab or pavement.

2. Encase all underground conduits not under building slab in concrete.

a. Concrete shall be dyed red throughout with a ratio of 15 pounds of dye per yard of concrete.

b. Provide minimum 3-inch concrete encasement around conduits not to exceed 6-inches on top.

c. Use suitable manufactured separators and chairs installed every 4 feet on centers. Securely anchor each conduit at each chair and securely anchor each end of the chair to prevent movement during concrete placement. Provide conduit spacers for parallel branch / feeder conduits.

d. Under building slab, conduits containing branch circuits for electrical, fire alarm, voice / data / video / communications shall be a minimum of 18 inches below top of slab and on select fill. All other conduits including main feeders for electrical voice / data video / communications, transformer primary and secondary, and panel feeds shall be minimum 48 inches below top of slab and on select fill.

e. Outside of building slab, conduits containing branch circuits for electrical, fire alarm, voice / data / video / communications shall be minimum 40 inches with 36 inches to top of concrete below finished grade or pavement. Do not overfill ditch with concrete.

f. Outside of building slab, conduits containing main service feeders for electrical, voice / data / video / communications, transformer primary and secondary, and panel feeds shall be a minimum of 52 inches with top of concrete 48 inches below finished grade or pavement. Conduits for electrical service primary for utility owned electrical service transformers hall also comply with the respective utility company requirements and standards. Do not overfill ditch with concrete.

3. Provide red 6 inch wide plastic underground warning tape with suitable warning legend. Tape shall be buried at a depth of 6 inches below grade, pavement or slab.

4. Provide magnetic marking tape on top of red concrete before fill.

5. Changes in direction of underground conduit main feeders for electrical, voice / data / video / communications, transformer primary and secondary, and panel feeds exceeding a total of 10 degrees either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius or curvature of 5 feet.

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.

7. 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.

C. Conduit installed above grade exterior of building:

1. Galvanized rigid steel where subject to physical damage. Coordinate with Owner before installation. Owner has final approval for use.

2. Aluminum rigid conduit.

D. Conduit shown in concrete floor or roof slab:

1. PVC Coated Galvanized Rigid steel.

E. Conduits within 100 feet of cooling towers, at designated corrosive locations, or where conduit penetrates concrete slab.

1. PVC coated galvanized rigid steel

F. Connections to equipment mounted on roof, rotating equipment, transformers, kitchen or food processing equipment, damp locations, and interiors of outside equipment or where flexible conduit is required outdoors:

1. Liquid tight flexible metal conduit (1/2 inch minimum, 6 foot maximum length)

G. Light fixture whips:

1. ½-inch flexible metal conduit

2. Length not to exceed 6-feet 0-inches

H. Conduits at Natatorium or therapeutic pool areas; conduit within 100 feet of Natatorium or therapeutic pool exhaust equipment openings; conduit at Natatorium or therapeutic pool HVAC, pumping and water treatment areas:

1. PVC coated galvanized rigid steel conduit, fittings and accessories

2. Stainless steel conduit, fittings, and accessories

I. Conduits in classified hazardous (Classified) locations:

1. Conduit fittings and seals UL listed for the classification

1.05 CONDUIT PENETRATIONS, SLEEVES AND ESCUTCHEONS

A. Furnish minimum ¾ inch RGC threaded conduit sleeves, larger when required through walls with plastic bushings on both ends for cabling installations. Bushings are to be installed before cable

pull. Cut bushings are not allowed.

B. Conduits and sleeves passing through smoke or fire rated walls or floor shall be sealed with UL listed caulk approved for the application.

C. Conduit passing through the housing on connected equipment shall pass through a cleanly cut hole protected with an approved grommet.

D. Route conduit through roof openings for piping, ductwork, or through an approved roof jack / housing

1.06 TECHNOLOGY/VOICE/DATA/VIDEO COMMUNICATIONS, SIGNAL, FIRE ALARM, SECURITY, BMCS, ETC., 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. Conduit size shall be minimum 1 inch; ¾ inch for BMCS T-stat, security and fire alarm, unless otherwise indicated on drawings. All cables routed through open spaces (no-ceiling below roof deck or above floor deck), exterior of building, or above an inaccessible ceiling (hard ceiling) shall be routed in conduit. All low voltage cabling can be installed above accessible ceilings without conduit but shall be plenum rated. Conduit rough-in of these cables shall include a 90-degree turn-out to an accessible location with plastic bushing on the end of the conduit. Bushings are to be installed before cable pulls. Cut bushings are not allowed.

1. Provide conduit from each telephone / voice outlet box to accessible ceiling plenum.

2. Provide conduit from each technology / data / communications outlet box to accessible ceiling plenum.

3. Provide conduit from each cable TV / video / audio outlet box to accessible ceiling plenum.

4. Provide conduit from each security / surveillance device outlet box to accessible ceiling plenum.

5. Provide two conduits for each combination data/voice/video outlet box and each outlet box indicated to contain more than four data, voice, or video drops to accessible ceiling plenum.

6. Provide conduit from each BMCS T-Stat outlet box to accessible ceiling plenum.

7. Provide conduit from each fire alarm outlet box to accessible ceiling plenum.

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. Outside Plant: Install a pull box every 300-feet or after 180 degree turns. All turns should 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 radial sweep. If field conditions absolutely mandate a sharp 90 bend to be installed, then a pull box shall be installed at that location regardless of distance.

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 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 (3) one-inch ribbed innerducts in each 4-inch conduit when required.

1.07 ALUMINUM ALLOY CONDUCTORS

A. Written Owner approval is required for each project to use aluminum alloy conductors. When approved or specified, provide the required conduit size based on conduit fill using NEC for the conductor type used.

1.08 IDENTIFICATION

A. Attach orange banding with black lettering (red banding for emergency power or F/A) using the wraps on 2” and larger conduits on either side of walls or floors identifying contents of conduits (480V power, 208V power, 240V power, data, F/A, etc).

END OF SECTION 26 05 33

SECTION 26 05 38
ELECTRICAL FLOOR BOXES AND FITTINGS

PART 1 – GENERAL

1.01 ACCEPTABLE MANUFACTURERS

A. Thomas & Betts, Memphis, TN

B. Hubbell

C. Wiremold

1.02 MATERIALS - FLOOR BOXES

A. Floor boxes used in floors with waterproof membranes shall be cast iron, painted inside and out with weatherproof paint intended for use on metal as indicated on the plans.

B. Floor boxes used in floors without waterproof membranes shall be formed steel with zinc or cadmium plate at least .0005" thick on the outside and .00015" thick on the inside as indicated on the plans.

C. Carpet or tile frame shall be brass.

D. Cover assembly shall protect against the ingress of water or foreign material with a gasket and shall be UL listed as mop tight.

1.03 GENERAL DESIGN - FLOOR BOXES

A. Boxes shall accept conduit sizes as required.

END OF SECTION 26 05 38

SECTION 26 05 45
CABLE TRAY

PART 1 – GENERAL

1.01 INSTALLATION

A. Provide minimum six-inch separation from all light fixtures and lighting ballast. Provide minimum 12-inch separation from EMI producing sources running in parallel. Coordinate routing with other trades to conserve space above ceiling and to ensure access to cable tray system.

B. Support cable tray with 3/8” all-thread on 5’-0” centers with manufacturer recommended support components. All-thread shall not be positioned inside the cable tray.

C. Cable tray sides are not to be cut or altered due to existing or future trade installations such as conduits, boxes, piping, support systems, ect.

D. Cable tray when installed shall not cover any part of a box, gutter, condulet, or in any way hinder access to an item that may require a maintenance activity.

END OF SECTION 26 05 45

SECTION 26 05 53
IDENTIFICATION OF ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.01 IDENTIFICATION

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 white letter on black background (white letter on red background for emergency circuits, white letter on orange background for solar photovoltaic systems) laminated plastic engraved identifying nameplate (label) shall be permanently secured to each switchboard, distribution panel, motor control center, transformer, panelboard, safety disconnect switch, enclosed circuit breaker, wireway, busduct plug, terminal cabinet, TVSS protection device, capacitor, individual motor controller, contactor, fire alarm panels (main and remote booster) communications (voice, data, video) cabinet or rack, rooftop equipment (ie. supply and exhaust fans, HVAC equipment), BMCS control cabinets, local sound system control cabinet, security panel, main service ATS, wall mounted GTD, time clock or other controlling devices, equipment integral disconnect switch/breaker, toggle or manual motor switch operating equipment, exterior J-boxes, exterior pull boxes, and exterior gutters. Exterior nameplates shall be secured using stainless steel hardware and use nuts and bolts where conductors are subject to damage. Every type of panel or equipment requiring power, regardless of which discipline bought or installed said items, shall have a label installed that includes the electrical panel and circuit ID and location of the electrical panel.

   a. Identifying nameplates shall have ½-inch high engraved letters for equipment designation and ¼-inch high letters indicating (equipment location if applicable, i.e. disconnects) source circuit designation and source circuit graphic location. The wording “Fed From”and “Located” shall be used as in the following name plate example.

      Example:

         Panel HA

         Fed From MSB

         Located Main Elec. RM 100

      Example for Disconnect:

         Disconnect for Panel LK

         Located Kitchen

Fed from Transformer TLK

Located Mech. Rm 100

b. Each switchboard, distribution panel, I-Line panelboard, and motor control center branch circuit device shall have a nameplate showing the load and location of load served in ¼-inch high engraved letters. These items are not to have designated breaker spaces or panel schedules.

c. Each section of multiple section panelboards shall also indicate panelboard section number (i.e. Panel HA Section 2, Fed from MSB, Located Main Elec. Rm. 100)

d. Individual starter and contactor nameplates are to 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 (ie. 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	Receptacle Contactor
West Parking Lot Pole Lights	Stud. Table Recpts Sci. Lab Rm 100
Fed From Panel HA-2,4,6	Fed From Panel LA-2,4,6,8
Located Main Elec. Rm. 100	Located Mech. Rm. 110
Control Circuit-Panel LA 42	Control Circuit-Panel LA-42
Located Main Elec. Rm. 100	Controlled-Emergency Shut Off Mushroom
Controlled-BMC	Switch Rm 101

e. 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.

f. 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.

g. 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 PISD 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.

h. 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 Wall Mounted Lighting GTD Example

ATS-1	**GTD**
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

3. Plastic cardholders and directory cards shall be furnished for circuit identification in panelboards and dimmer panels. Cardholder shall be located on inside of panelboard door and on exterior of dimmer panel. Directory card shall be super heavy weight index card stock, 110 lb., and white. 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 room name designation listed on door signage and name of each item served. If no individual identifying building appointed room names or numbers are listed on signage, or signage is not provided for any room, list locations per the following examples –A. Storage in RM 100 –B. Staff RR adjacent to RM 100 –C. Office west of RM 100. Corridors are to be listed per PISD electrical representative. All locations served by breakers shall be listed on schedule.

    a. Circuits controlled by contactors shall include in listing that it is controlled by contactor, contactor name, and location of contactor. Example of circuit entry --- Breaker #2. Pole Lights, West Parking Lot, thru Contactor C1 located in Mech. Rm 100.

    b. Panel schedule shall be large enough to contain all information required. Letter and numerical font size shall not be smaller than #9. Minimum size is 5-1/2” by 5-1/2”. Word abbreviations are subject to approval by PISD electrical representative. Plastic cardholders are to be sized so schedules are not folded to fit.

    c. Do not use architectural room number or area designation shown on plans. If Architect’s assigned final graphics room number does not match final graphics signage installed, the number or name on the signage shall be used. In the event no name or number is assigned, they shall be listed per PISD electrical representative.

    d. Company logo, etc. shall not be on panel or breaker information areas of schedule. Company information may be placed at top or bottom of schedule away from panel or breaker information.

4. Permanent, waterproof, black markers shall be used to identify each lighting and power grid junction / pull box, gutter and wireway. Clearly indicate the panel and branch circuit numbers in the boxes, gutters or wireway. Do not use the words “pull box” for identification. Feeder junction / pull box, gutter shall list equipment fed and where fed

from, example –Panel HA fed from MSA. Boxes used for installation of relays, ballasts, or any other equipment where field installations are required, shall be labeled for equipment contained, load served, panel and circuit numbers, example – Neon Light Ballasts, Panel LA-2.

B. Wire and Cable Markers: Provide vinyl cloth markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.

C. Wire and Cable Labeling: Provide factory wire markers on each conductor in all boxes, pull boxes, gutters, wireways, contactors, motor controllers, fire alarm panels, control cabinets such as BMCS, sound, security, disconnects, time clocks, and at all other terminations.

D. Underground Warning Tape: Thomas and Betts or approved equal. Six-inch wide plastic tape colored red with suitable warning legend describing buried electrical lines, data, communications, fire alarm, or any other underground conduit systems. Tape shall be buried 12” below grade directly over conduit systems. Provide magnetic marking tape below all underground conduits not encased in concrete and directly on top of concrete encased conduits.

1.02 IDENTIFICATION FOR ELECTRICAL SYSTEMS

Furnish and install items for identification of electrical products installed.

A. Manufacturers:

1. W.H. Brady Co.
2. Carlton Industries, Inc.
3. Seton Nameplate Co.

B. Materials:

1. Nameplates: (as indicated above)
2. Underground Warning Tape
    a. Manufactured polyethylene material and unaffected by acids and alkalis.
    b. 3.5 mils thick and 6 inches wide.
    c. Tensile strength of 1,750 psi lengthwise.
    d. 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.

C. 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 panel board.

1. Provide a typed circuit directory card upon completion of work. Directory card shall be ofsuper heavy weight index card stock, 110lb, and white. Directory shall include type of

load (i.e.: receptacles, lighting, emergency lighting, exhaust fan, etc) and location (i.e.: room 102, Office in Room 102, Staff RR adjacent to Room 102, etc.). Room number shall be identified as the actual graphics room number/name listed on room signage and not the room number used on the construction documents. In the case a room does not receive signage, or a generic name is listed on signage (i.e. boy's RR, Staff RR, Storage, Mech Room, etc.) PISD electrical representative shall be contacted for location entry information. Circuits controlled by starter and/or shunt trip shall have included in the listing location of starter and/or shunt trip panel and circuit ID (i.e. North Kit. Vent Hood EF-1 through starter located in Kitchen, controlled BMCS and local switch, shunt trip circuit LK-2). All breakers controlled via contactors and starters or supply control voltage shall provide information in space to include exact location of contractor/starter and how controlled. All spaces containing breakers shall be identified. 2 and 3 pole breakers shall have information on each space. Spare breakers shall be listed as spare. Blank spaces (no breakers installed) shall be blank. Directory cards shall contain numbered spaces to match spaces in panels.

END OF SECTION 26 05 53

SECTION 26 08 00
ELECTRICAL AND LIFE SAFETY SYSTEMS TECHNICAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.02 SUMMARY

A. The purpose of this Section is to define responsibilities in the Commissioning Process. Other electrical system testing is required under other Division 26 Specification Sections. National Electrical Installation Standards (NEIS) NECA 90-2004, “Recommended Practice for Commissioning Building Electrical Systems”, 27th Volume of the NEIS Series, provides additional guidance for the commissioning of electrical systems.

B. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. General Commissioning Requirements are provided separately and coordination is detailed in Division 01. Division 26 and 28 Contractors shall be familiar with all parts of Division 01, the General Commissioning Requirements and the Commissioning Plan issued by the Owner’s CxA, shall execute all Commissioning responsibilities assigned to them in the Contract Documents and include the cost of Commissioning in the Contract price.

C. Electrical Testing Agency (ETA)

1. The Contractor shall retain an independent Electrical Testing Agency (ETA). Their specific testing responsibilities are delineated in individual technical sections within Division 26. This generally requires checking and testing of the electrical power distribution equipment per National Electrical Testing Association (NETA) Acceptance Testing Standards (ATS).

2. Attend, as needed, Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Contractor, Owner or CxA to facilitate the Commissioning process.

3. Obtain all required manufacturer’s data to facilitate tests.

4. Provide assistance to the CxA in preparation of the specific System Verification Checklists (SVC) and Functional Performance Test procedures.

5. Generally, the ETA shall provide their standard forms to document the NETA tests to be incorporated into the System Verification Checklists and Functional Performance Test records.

6. The ETA shall assist the Contractor in completing required SVC information such as relay settings, protective overload settings, and equipment ratings utilizing the protocols in the Commissioning Plan.

7. Perform and clearly document all completed Start-up and system operational checkout procedures, providing a copy to the Contractor.

8. Clearly indicate any deficiencies identified during testing and add to an action list for resolution and tracking. The field technicians shall keep a running log of events and issues.

9. Provide skilled technicians to execute testing. Ensure that they are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

D. Electrical systems to be commissioned include the following:

1. Unit Substations / Electrical Switchboards

2. Secondary Normal Power Distribution

3. Emergency / Standby Power Distribution

4. Branch Power Distribution and Components

5. Emergency Generators and Paralleling Switchgear

6. Uninterruptible Power Supplies (UPS)

7. Lighting Controls - Occupancy Sensors (25% greater than 25 sensors installed, 100% less than 25 sensors installed)

8. Lighting - Daylight Controls (100%)

9. Lighting - Time Switch Controls (100%)

1.03 DEFINITIONS

A. Refer to Division 01: General Commissioning Requirements for definitions.

1.04 SUBMITTALS

A. Contractor shall provide Owner and / or CxA with documentation required for Commissioning Work. At minimum, documentation shall include: Detailed Start-up procedures, full sequences of operation, Operating and Maintenance data, performance data, control drawings, and details of Owner-contracted tests.

1. Shop drawings and product submittal data related to systems or equipment to be commissioned.

B. Contractor shall submit to Owner and / or CxA installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians.

C. Where installation testing may be performed in a progressive manner (ie. grounding systems, insulation resistance, etc.), the Contractor shall prepare and submit to the Owner, A/E team and CxA a testing plan that details how the progressive testing will be performed, documented and presented for approval prior to the start of any testing activities.

D. Contractor shall provide Owner with documentation required for Commissioning work. At minimum, documentation shall include: Detailed Start-up procedures, Full sequences of operation, Operating and Maintenance data, Performance data, Functional Performance Test Procedures, Control Drawings, and details of Owner-Contracted tests.

E. Contractor shall provide any additional documentation needed to complete the requirements of the Commissioning Process

1. Factory Performance Test Reports: Review and compile all factory performance data to assure that the data is complete prior to executing the FPTs.

2. Incorporate manufacturer's initial energizing / startup procedures with System Verification Checklists.

3. Final Electrical Testing Agency (ETA) Reports documenting all NETA requirements indicated in the Project Documents

4. Completed equipment Start-up certification forms along with the manufacturer's field or factory performance and Start-up test documentation.

5. Operating and Maintenance (O&M) information per the requirements of the Technical Specifications and Division 01 requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials and installation shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Refer to the General Commissioning Requirements for other work products related to the Commissioning Process

C. Contractor is required to follow all applicable industry and site specific safety practices, lockout / tagout requirements, specialized PPE requirements, and provide qualified, trained personnel to execute Commissioning Process requirements.

2.02 TEST EQUIPMENT

A. The Contractor shall provide all specialized tools, test equipment and instruments required to execute Start-up, checkout, and testing of equipment.

B. All specialized tools, test equipment, and instruments required to execute Start-up, checkout, and testing of equipment shall be of sufficient quality and accuracy to test and/or measure system performance within specified tolerances. A testing laboratory must have calibrated test equipment within the previous twelve (12) months. Calibration shall be NIST traceable. Contractor must calibrate test equipment and instruments according to manufacturer's recommended intervals and whenever the test equipment is dropped or damaged. Calibration tags must be affixed to the test equipment or certificates readily available.

PART 3 – EXECUTION

3.01 CONSTRUCTION PHASE

A. In each purchase order or subcontract that is written for changes in scope, include the appropriate requirements for submittal data, commissioning documentation, testing assistance, Operating and Maintenance (O&M) data, and training, as a minimum.

B. Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Owner, CxA or Contractor to facilitate the Commissioning process.

C. Provide manufacturer's data sheets and shop drawing submittals of equipment.

D. Provide additional requested documentation to the Owner and / or CxA, prior to O&M manual submittals, for development of System Verification Checklists and Functional Performance Testing procedures.

1. Typically, this will include detailed manufacturer's installation and Start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, full factory testing reports, if any, and full warranty information.

2. In addition, the installation, Start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Contractor and / or CxA.

3. This information and data request may be made prior to normal submittals.

E. With input from the Lighting Controls, PCMS vendors and A/E, clarify the operation and control of commissioned equipment in areas where the Specifications, control drawings, or equipment documentation are not sufficient for writing detailed test procedures.

F. During the installation, Start-up and initial checkout process, execute and document related portions of the System Verification Checklists for all commissioned equipment according to the procedures indicated in the Commissioning Plan.

G. Factory Start-ups: Factory Start-ups are specified for certain equipment. Factory Start-ups generally are Start-up related activities that will be reviewed and checked prior to Functional Performance Tests. All costs associated with factory Start-ups shall be included with the contract price unless otherwise noted. Notify the Commissioning Team of the factory Start-up schedule and coordinate these factory Start-ups with witnessing parties. The Commissioning Team

members may witness these Start-ups at their discretion.

H. Independent Testing Agencies: For systems that specify testing by an independent testing agency, the cost of the test shall be included in the Contract price unless otherwise noted. Testing performed by independent agencies may cover aspects required in the System Verification Checklists, Start-ups, and Functional Performance Tests. Coordinate with the independent testing agency so that CxA, Owner and/or A/E can witness the test to ensure that applicable aspects of the test meet requirements.

I. Provide skilled technicians to execute starting of equipment and to assist in execution of Functional Performance Tests. Ensure that they are available and present during the agreed-upon schedules and for a sufficient duration to complete the necessary tests, adjustments, and problem solving.

J. Correct deficiencies (differences between specified and observed performance) as interpreted by the Owner's Project Manager and A/E and retest the system and equipment.

K. During construction, maintain as-built marked-up Drawings and Specifications of all Contract Documents and Contractor-generated coordination Drawings. Update after completion of Commissioning activities (include deferred tests).

L. Provide training of the Owner's operating personnel as specified.

M. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

3.02 WARRANTY PHASE

A. Execute seasonal or deferred tests, witnessed by the CxA and Owner, according to the Specifications.

1. Complete deferred tests as part of this Contract during the Warranty Period. Schedule this activity with the Owner.

B. Correct deficiencies and make necessary adjustments to O&M manuals, Commissioning documentation, and as-built drawings for applicable issues identified in any deferred or seasonal testing.

3.03 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 installation shall be in accordance with the Project Documents.

3.04 TRAINING

A. Refer to the individual section of this Specification for specific training requirements on each system.

B. Refer to the General Commissioning Requirements and Division 01 of the Project Specifications for overall training requirements related to the Commissioning process and this project.

END OF SECTION 26 08 00

SECTION 26 09 21
MOTOR CONTROL CENTERS

PART 1 – GENERAL

1.01 ACCEPTABLE MANUFACTURERS

A. Schneider Electric - Square D

1.02 INSTALLATION OF MOTOR CONTROL CENTERS

A. Concrete Pads: Install each motor control center on a 4-inch reinforced concrete housekeeping pad. The housekeeping pad shall extend 3-inches beyond the housing of the motor control center, unless shown otherwise. Furnish the position of any block outs, dimensions, and location of the housekeeping pads to prevent delay of the concrete work.

END OF SECTION 26 09 21

SECTION 26 09 26
DIGITAL LIGHTING CONTROL SYSTEMS - GREENGATE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Occupancy, Vacancy and Daylighting Sensor Control

2. Emergency Lighting Control (if applicable)

B. Related Section

1. Section [260926 – Lighting Control Panel Boards:] Lighting panels (switching) controlled by ControlKeeper

2. Section [260936 – Modular Dimming Controls:] Room Controller QuicKit

3. Section [262726 - Wiring Devices:] Receptacles

4. Section [265113 – Interior Lighting Fixtures, Lamps, and Ballasts:] Fluorescent electronic dimming ballasts

5. Section [25000 – Integrated Automation] Building integrator shall provide integration of the lighting control system with Building Automation Systems

6. Electrical Sections, including wiring devices, apply to the work of this Section

C. Control Intent – Control Intent includes, but is not limited to:

1. Defaults and pre-defined calibration settings for such items as daylighting, occupancy sensor times, sensitivity, fade rates, etc.

2. Wallstation pre-defined control sequences

3. Scene Wallstation programmable control sequences

4. Daylight sensor and switching zones

5. Receptacle controls

6. Demand Response control (if applicable)

7. Emergency Lighting control (if applicable)

1.02 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (www.ansi.org and www.ieee.org)

B. International Electrotechnical Commission (IEC) (www.iec.ch)

C. International Organization for Standardization (ISO) (www.iso.ch):

D. National Electrical Manufacturers Association (NEMA) (www.nema.org)

E. WD1 (R2005) - General Color Requirements for Wiring Devices.

F. NEMA WD7 -

G. Underwriters Laboratories, Inc. (UL) (www.ul.com):

1. 508 – Industrial Control Equipment

2. 924 – Emergency Lighting

1.03 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:

1. Room Controllers – Stand-alone three relay controller with 0-10 volt control for ballasts or LED drivers with integral UL 924 emergency relay (model dependent), that RCQK smart devices connect to over the RCQK communications network.

2. Network Room Controllers – Stand-alone three relay controller with 0-10 volt control for ballasts or LED drivers with integral UL 924 emergency relay (model dependent), that RCQK smart devices connect to over the RCQK communications network.

3. Occupancy Sensors – Auto adjusting, MicroSet technology NEMA WD7 compliant occupancy sensors.

4. Wallstations – Smart device that is pre-configured, pre-engraved digital pushbutton wallstations and dimmers.

5. Scene Wallstation – Smart device that is pre-configured, pre-engraved digital pushbutton scene wallstations, dimmers and programmable scene buttons.

6. Daylight Photosensor – Smart device that is a multi-zone open loop daylight sensor with two-way active infrared (IR) communications, which can provide dimming control for daylight harvesting and personal control and programming for the space.

7. Demand Response – OpenADR or other demand response input shall be connected to one or more Room Controllers. Each Room Controller shall respond to the demand response input and automatically reduce the light level by at least 15% but not more than 40% of target light level.

1.04 LIGHTING CONTROL APPLICATIONS

A. Minimum lighting control performance required, unless local Energy Code is more stringent.

1. Occupancy/vacancy requirements – Provide an occupancy/vacancy sensors with Manual On/ Automatic Off or Automatic On/ Automatic Off functionality in all spaces. Manual On vacancy sensors should be used for any enclosed space with a Manual On switch that does not require hands free operation. Spaces with multiple occupants or where line of sight might be obscured ceiling or corner mount sensors and Manual wallstations would be required. Automatic On of lighting via occupancy sensor cannot exceed 30% of lighting. Systems that do that allow the user to select Occupancy or Vacancy Mode shall not be acceptable.

2. Bi-Level switching – Provide multi-level switching and/or variable dimming for maximum energy savings.

3. Task Lighting / Receptacle Control – Provide automatic shut off of non-essential plug loads and task lighting in all spaces. Provide Manual On or Automatic On of receptacles whenever spaces are occupied. Receptacle Control will only be shut off when no occupancy is detected within the space. Systems that do not provide receptacle control for a full 20 Amp circuit shall not be acceptable.

4. Daylight Zones – Primary sidelit or toplit areas within an enclosed space shall be controlled separately and automatically by a multi-level photocontrol device without the need for programming. Adjustments to the daylight zones must be provided by a simple to use, intuitive remote handheld device.

5. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to dim electric light to the lowest light level.

6. Provide the ability to adjust the high end and low end trim of the dimmers to ensure the lighting automatically provides energy saving even when daylighting calls for full illumination.

7. Provide the ability for the dimmers and the relays to function separately. Systems where the 0-10V dimmers and relays are tied together reduce design capabilities and shall not be acceptable.

8. Provide the ability to provide occupancy status to a Building Automation System. Occupancy status shall happen automatically and be provided to the BAS without the need of programming any device in the Room Controller System. Systems that require programming for BAS occupancy status shall not be acceptable.

9. Shall be capable of automatically responding to a Demand Response Signal and adjusting the lighting level, without the need of programming or software. Systems that require software or commissioning to provide Demand Response integration shall not be acceptable.

B. Additional controls:

1. Provide occupancy or vacancy sensors (Auto On or Manual On) for any enclosed office, conference, meeting or training rooms. Spaces with multiple occupants or where line of sight may be obscured require ceiling or wall/corner mounted sensors with Manual On switches.

2. Conference, meeting, training, auditoriums and multi-purpose rooms shall have controls that allow for scene based and independent control of each output. Rooms larger than 300 square feet shall support at least four (4) pre-set lighting scenes. Occupancy or vacancy sensors shall ensure all lighting, receptacles, and HVAC in the space is turned Off when no occupancy.

3. Provide integral control of an adjustable toplight control system such as a Solatube® Daylight Dimmer. Coordinate the adjustable toplight control with wallstation push buttons for A/V Mode and presentations to automatically reduce the amount of toplight when pressed. Systems that require additional interfaces for connection and control or programming shall not be acceptable.

4. Egress lighting control shall be integral to the system. The system shall provide an automatic control of adjacent corridor and/or egress lighting based upon room occupancy without programming. Systems that do not ensure that adjacent corridor and/or egress lighting is controlled with room occupancy shall not be acceptable.

5. Provide integral connection for a healthcare patient pillow speaker for integration between the lighting control system, nurse call system and room entertainment system. The pillow speaker shall be provided from the same manufacturer as the lighting control system, which allows integration with multiple nurse call systems. The pillow speaker shall provide control of 0-10V dimming of up to three zones from the patient bed. Systems that utilize dry contact inputs from the nurse call system may not provide full dimming of up to three zones and shall not be acceptable. For pillow speaker, use the Cooper Lighting Solutions catalog numbers: [RC3DEHC-PL] for Room Controller, [GG37-P], [GPCS-3Z-DIM].

1.05 PERFORMANCE REQUIREMENTS

A. The Room Controller QuicKit shall be accompanied by: recessed or suspended luminaires specified as fluorescent or LED with defined CRI and lumen output, provided by the same manufacturer as the control systems.

B. The Room Controller QuicKit shall include: the Room Controller (RC3-PL, RC3D-PL, or RC3DE-PL), wallstations, matching color screwless wallplates, occupancy sensor, Daylight Sensor, Receptacle Switchpack, QuickConnect cable (plenum or non-plenum pre-terminated and defined for package).

C. The Room Controller Starter Kit shall include: the Room Controller (RC3D-PL, or RC3DE-PL), Receptacle Switchpack, plenum QuickConnect cable (defined for package).

1.06 SUBMITTALS

A. Submittals Package: Submit the shop drawings and the product data specified below at the same time as a package.

B. Shop Drawings:

1. Composite wiring and/or schematic diagram of each control circuit, as proposed, to be installed (standard diagrams will not be accepted).

2. Scale drawing for each area showing exact location of each sensor, room controller and digital switch.

C. Product Data: Catalog sheets, specifications and installation instructions.

D. Include data for each device which:

1. Indicate best mounting and installation locations for each device. This may be contained within drawings or installation instructions depending upon the project.

E. Warranties: Standard and special warranty information.

1.07 QUALITY ASSURANCE

A. Manufacturer: Minimum [10] years experience in manufacture of lighting controls.

B. Products: All electrical components and devices shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency and marked for intended use.

C. Comply with NFPA 70.

D. Source Limitations: Obtain luminaires and control systems from a single manufacturer.

1.08 DELIVERY, STORAGE AND HANDLING

A. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements.

B. Packaging: All components of the lighting control system shall be packaged in a single box as a QuicKit or as individual components. The QuicKit catalog number will be marked on package label along with bill of materials. Individual component packages will be marked with product catalog number.

C. Handling: Packaging will include clear installation instructions for all components with typical illustrations of installation locations and connections. The installing contractor can easily match each package to the layout on the design floor plans.

1.09 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 0° to 40° C (32° to 104° F)

2. Relative humidity: Maximum 90 percent, non-condensing

B. Coordinate layout and installation of luminaries and controls with other construction.

C. Coordinate site commissioning with manufacturer no less than 21 days prior to required date.

1.10 WARRANTY

A. Manufacturer shall supply a 5-year warranty on all hardware and software. These warranties will be in effect for all installations. Systems that provide special warranties based on installation shall not be acceptable.

1.11 MAINTENANCE

A. Provide extra materials described below when needed. Products shall match those that are installed. Extra materials should be stored and identified with labels describing contents. Inclusion of extra materials on the bill of materials is not the responsibility of the manufacturer.

B. Recommended extra materials:

1. Occupancy Sensors: Provide 1 of each product type for every 200 installed, to be used for maintenance.

2. Daylight Sensors: Provide 1 of each product type for every 100 installed, to be used for maintenance.

3. Wallstations: Provide 1 of each product type for every 200 installed, to be used for maintenance.

4. Receptacle Switchpack: Provide 1 of each product type for every 100 installed, to be used for maintenance.

5. Room Controller: Provide 1 of each product type for every 200 installed, to be used for maintenance.

6. QuickConnect Cable: Provide 1 of each product type for every 200 installed, to be used for maintenance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer:

1. Cooper Lighting Solutions

B. Substitutions: [Not Permitted]

1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

2. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design, highlighted in an alternate color, to the engineer for review and approval prior to rough-in.

2.02 WALL OR CEILING MOUNTED OCCUPANCY PERFORMANCE REQUIREMENTS

A. Sensing mechanism:

1. [Infrared]: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.

2. [Ultrasonic]:

a. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.

b. Utilize Doppler shift ultrasonic detection technology.

3. [Dual technology]:

a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.

b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.

c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be considered.

B. Power failure memory:

1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

C. Designed and tested to withstand discharges of 15,000 volts per IEC 801-2 without impairment of performance.

D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.

E. Sensor shall have time delays from 10 to 30 min.

F. When specified, sensors shall automatically adjust time delay and sensitivity settings.

G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit

tampering.

I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.03 CEILING MOUNTED SENSORS

A. Product: [OAC-DT-2000], [OAC-DT-1000], [OAC-P-1500], [OAC-U-2000].

B. Provide all necessary mounting hardware and instructions.

C. Sensors shall be Class 2 devices.

D. Connect to Room Controller via Click & Go cable to eliminate wiring errors.

1. [OCC-RJ45] Room Controller accessory is used to allow any standard occupancy/vacancy sensor to utilize Click & Go cable connections.

2. Two RJ45 connection ports for connection to Room Controller.

3. Occupancy Sensor and Daylight sensor shall be capable of a daisy chain connection to the Room Controller.

E. Device calibration and features:

1. Sensitivity – 0-100% in 10% increments.

2. Time delay – 1-30, self-adjusts to 10 min based on room occupancy.

3. Test mode – Fifteen second time delay.

4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

5. Walk-through mode.

6. Ultrasonic and Dual Technology Sensors utilize two independent sensor detection circuits simultaneously to ensure optimum performance, regardless of location or proximity to walls and structures.

7. Ultrasonic and Dual Technology Sensors utilize Variable Drive Circuitry (VDC) in cases of over saturation from misapplication, which automatically adjusts the volumetric output without reducing detection capability. Systems that reduce detection coverage area shall not be acceptable.

8. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency, continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.

9. All load parameters including Automatic On/Manual On, blink warning and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.

F. Device Status LEDs including:

1. PIR Detection

2. Ultrasonic detection

G. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.

H. Manual override of controlled loads.

I. Multiple occupancy sensors may be installed in a room by simply daisy-chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required

J. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].

K. Sensors shall be RoHS compliant.

2.04 WALL/CORNER MOUNTED SENSORS

A. Product: [OAWC-P-120W], [OAWC-P-009L-H], [OAWC-DT-120W],

B. Provide all necessary mounting hardware and instructions.

C. Sensors shall be Class 2 devices.

D. Connect to Room Controller via Click & Go cable to eliminate wiring errors.

1. [OCC-RJ45] Room Controller accessory is used to allow any standard occupancy/vacancy sensor to utilize Click & Go cable connections.

2. Two RJ45 connection ports for connection to Room Controller.

3. Occupancy Sensor and Daylight sensor shall be capable of a daisy-chain connection to the Room Controller.

E. Device calibration and features:

1. Sensitivity – 0-100% in 10% increments.

2. Time delay – 1-30, self-adjusts to 10 min. based on room occupancy.

3. Test Mode – Fifteen second time delay.

4. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

5. Walk-Through Mode.

6. Automatically and continually self-adjust ultrasonic frequency to ignore specific frequency continuous noise from airflow to prevent detuning which can lead to inadvertent lights out. Sensors that require detuning shall not be acceptable.

7. All load parameters including Automatic On/Manual ON, blink warning, and daylight enable/disable when daylight sensors are pre-defined with the Room Controller local network.

F. Device Status LEDs including:

1. PIR Detection

2. Ultrasonic detection

G. Occupancy sensors are pre-defined to specific loads within the room without wiring or special tools for maximum energy savings.

H. Manual override of controlled loads.

I. Multiple occupancy sensors may be installed in a room by simply daisy chaining them together to the Room Controller via Click & Go cable. No additional configuration will be required

J. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].

K. Sensors shall be RoHS compliant.

2.05 ROOM CONTROLLER ZONE WALLSTATIONS

A. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:

1. Removable buttons for field replacement with engraved buttons and/or alternate color buttons [ENGRV-*BTNL-*], [ENGRV-*BTNS-*]. Button replacement may be completed without removing the switch from the wall.

2. Intuitive button labeling to match application and load controls.

3. Pre-defined digital button configurations. Each wallstation is shipped with pre-defined digital button configurations which are automatically sensed by the connected Room Controller and mapped to specific load controls for immediate out of the box functionality.

B. Two RJ-45 ports for connection to the Room Controller local network.

C. Multiple digital wallstations may be installed in a room by simply connecting them to the Room Controller local network. No additional configuration will be required to achieve multi-way switching.

D. Room Controller digital wallstations are delivered with pre-defined functions including, raise, lower, A/V Mode, Quiet Time, manual and scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do

not deliver maximum energy savings out of the box shall not be acceptable.

E. Optional custom labeling is available for application or location specific wallstation button labels.

2.06 ROOM CONTROLLER SCENE WALLSTATIONS

A. Low voltage momentary pushbutton switches in 2, 3, 4, 5 and 6 button configuration; available in white, ivory, grey and black; compatible with wall plates with decorator opening. Wallstations shall include the following features:

1. Removable buttons for field replacement with engraved buttons and/or alternate color buttons [ENGRV-*BTNL-*], [ENGRV-*BTNS-*]. Button replacement may be completed without removing the switch from the wall.

2. Intuitive button labeling to match application and load controls.

3. Pre-defined digital button configurations. Each scene wallstation is shipped with a pre-defined digital button configuration which is automatically sensed by the connected Room Controller and mapped to specific load controls for immediate out-of-the-box scene based functionality.

B. Two RJ45 ports for connection to the Room Controller local network.

C. Multiple digital wallstations may be installed in a room by simply connecting them to the Room Controller local network. No additional configuration will be required to achieve multi-way switching.

D. Room Controller Scene Wallstations are delivered with pre-defined scene control. No additional configuration is required to provide a fully functional system. Systems that require configuration or load binding and do not deliver maximum energy savings out of the box shall not be acceptable.

E. Optional custom labeling is available for application or location specific wallstation button labels.

F. Scene wallstations scene control shall be adjustable through a simple interface or handheld control for flexibility of lighting scenes. This personal remote shall allow individual zone control, scene control and scene setting capabilities. [HHPR-RC]

2.07 DAYLIGHTING ADJUSTMENT HANDHELD REMOTE CONTROLS

A. Battery-operated handheld 10 button configuration for remote daylight sensor configuration. Remote controls shall include the following features:

1. Two-way infrared (IR) transceiver for line-of-sight communication with the Room Controller daylight sensors within up to 30 feet.

2. Red communication LED on the daylight sensor confirms button press.

3. Inactivity timeout to save battery life.

B. Three intuitive daylight sensor range pushbuttons.

C. Intuitive daylight zone adjustment raise/lower pushbuttons.

D. Cooper Lighting Solutions catalog numbers: [HHPRG-RC].

2.08 PERSONAL ADJUSTMENT HANDHELD REMOTE CONTROLS

A. Battery-operated handheld 10-button configuration for remote daylight sensor configuration. Remote controls shall include the following features:

1. Two-way infrared (IR) transceiver for line-of-sight communication with the Room Controller daylight sensors within up to 30 feet.

2. Red communication LED on the daylight sensor confirms button press.

3. Inactivity timeout to save battery life.

B. Intuitive individual Control of each relay and 0-10V dimming zone.

C. Six user adjustable scene pushbuttons for simple selection and control of space lighting.

D. Cooper Lighting Solutions catalog numbers: [HHPR-RC].

2.09 ROOM CONTROLLERS

A. Room Controllers are fully functional out-of-the-box 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 will be simple to install and will include line voltage wiring space and will not require additional electrical junction boxes. The control units will include the following features:

B. Fully functional room configuration to the most energy-efficient sequence of operation based upon the connected devices in the room.

C. Simple replacement – Using the automatic configuration capabilities, a Room Controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.

D. Quick installation features including:

1. Included line voltage space to simplify wiring and eliminate the need for separate junction boxes.

2. Included emergency voltage space to simplify wiring of emergency luminaire connections.

3. Breakouts or knockouts for direct conduit connection.

4. Line and low voltage sections include conduit connection points. Systems that require special accessories for direct conduit connections may not comply with local building codes and shall not be acceptable.

5. Quick low voltage connections using standard RJ45 QuickConnect cable.

6. 120-277 VAC, 50/60 Hz input voltage.

7. Zero cross circuitry for each load.

8. Three relay configuration.

9. Efficient 150 mA switching power supply.

10. Six RJ45 Click & Go local network ports.

11. All models shall be available in either a plastic or metal enclosure for simplified installation in appropriate spaces

12. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.

E. On/Off/Dimming Room Controllers shall include:

1. Real time current metering (optional).

2. Room Controller metal enclosure options include a “-PL” in the catalog number.

3. Room Controller Network options include a “–N” in the catalog number.

4. Three relay, switching zone configuration [RC3, RC3-PL, RC3-PL-N]

a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.

5. Three relay, three 0-10V dimming zone configuration [RC3D, RC3D-PL, RC3D-PL-N].

a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.

b. Up to three 0-10V analog outputs per relay for control of compatible ballasts and LED drivers.

6. Three relay, three 0-10V dimming zone configuration with one emergency UL 924 relay [RC3DE, RC3DE-PL, RC3DE-PL-N].

a. All models support local network connections of wallstations, occupancy-based controls and receptacle controls.

b. Up to three 0-10V analog outputs per relay for control of compatible ballasts and LED drivers.

2.10 DAYLIGHT PHOTOSENSORS/ IR RECEIVER)

A. Daylight photosensors work with Room Controllers to provide automatic daylight dimming capabilities for any load type connected to a room controller. Open loop daylight sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Daylight sensors shall be interchangeable without the need for rewiring. Daylight sensors shall be

capable of daisy-chaining with occupancy sensors in each room.

B. Digital daylight sensors 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.

2. The daylight sensor has three light level ranges: Low (3-300 lux), High (30-3000 lux), and Direct Sun (300-30000 lux).

3. For dimming daylight harvesting, the daylight sensor shall provide the capability of controlling multiple (up to three) daylight zones immediately upon connection without programming.

4. Optional digital wallstations to allow occupants to reduce lighting level to increase energy savings and lower lighting levels for a selected period of time or cycle of occupancy.

5. Infrared (IR) transceiver for daylight sensor range and daylight zone gain adjustments via handheld remote programmer. [HHPRG-RC]

6. Infrared (IR) receiver for personal control and scene programming via handheld remote programmer. [HHPR-RC]

7. Red configuration LED that blinks to indicate data transmission.

8. Green Mode status LED that blinks to indicate Daylight Commissioning Mode.

9. Green Mode status LED that remains constant ON when daylight range is set to low for available natural light.

10. One RJ45 port for connection to Room Controller local network.

11. An adjustable head and an optional mounting bracket to accommodate multiple mounting methods and building materials. The daylight sensor may be mounted on a ceiling tile, skylight well, suspended lighting fixture or backbox.

C. Open loop digital daylight sensor includes 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 dimming set-points upon power up without any programming. Optional calibration using the wireless IR handheld programmer. [HHPRG-RC]

3. Cooper Lighting Solutions Catalog Number: [DS-FMOIR].

2.11 ROOM CONTROLLER LOCAL NETWORK

A. The Room Controller local network is a physical connection and communication protocol designed to optimally control a space within a building. Room Controller devices connect to the local network using CAT 5e cables with RJ45 QuickConnect cables which provide both data and power to room devices. Features of the Room Controller local network include:

1. Click & Go default functionality of occupancy sensors, wallstations, daylight sensors, receptacle controls, BMS status output and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

2. Replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

2.12 ROOM CONTROLLER NETWORK

A. The Room Controller network allows up to 254 lighting control panels to exist on a single communication network designed to optimally control a building. Digital communication shall be RS485 with each lighting control panel being a master to ensure no single point of failure.

B. Each panel shall have a unique device address. This allows for unique identification of the lighting control panel on the network.

C. Lighting control relays in any panel can be controlled via a network command sent from a panel on the network.

D. Breaks in the physical RS485 network shall not inhibit local panel operation. Systems that do not use Master/Master architecture shall not be acceptable.

E. The network shall be capable of connecting to the building LAN for easy TCP/IP access to the lighting control panels.

1. Network access to the building LAN shall be provided by an Ethernet Interface Module [EIM]

2. Access to computers on the building LAN shall be secured by site user name and password policies (provided by local site IT).

F. Setup and programming of each panel on the network is performed using the Keeper Enterprise software. Network programming can be achieved by any factory certified personnel, which may include Electrical Contractors, Agents, Customer, Factory Representatives, or Factory Employees. System that require startup and programming to be performed only by Factory Employees shall not be acceptable.

2.13 NETWORK ACCESSROIES AND CONTROL INTERFACES

A. Ethernet Interfaces; Cooper Lighting Solutions Model Ethernet Interface Module

1. Provide ability to communicate by means of TCP/IP over Ethernet to ControlKeeper lighting control system by means of user-supplied PC or digital audiovisual equipment. Control to be located within 300 feet (100 meters) of Ethernet source.

2. Communications protocol to provide access to:

a. Individual Relay Commands

b. Individual Relay Status

c. Input Status

d. Network Override Commands

B. Network Programming Software; Cooper Lighting Solutions Model Keeper Enterprise Programming software.

1. The software permits the organization of the lighting control panels into Buildings and Networks.

2. Multiple panels and panel types can exist in a building or network.

3. Each Network permits the ability to have a dedicated IP address for communications.

4. The software shall permit the following to be programmed for each Room Controller panel

a. Name descriptor

b. Panel address and communication method

c. Panel firmware updates over the network

d. Define, broadcast and log Output information

e. Define daylight gain settings for three dimming zones

f. Adjust High End/Low End trim settings for each panel

g. Adjust Demand Response values for each panel

h. Configure Remote network listener commands, to take action based on inputs from other panels on the network

i. Configure scene values for each panel

j. Copy/paste already programmed panels for template driven programming

C. (Optional) The lighting zones may be controlled using standard calendar based scheduling software. Create events which include individual and groups of relays and link them to any time and day on the calendar. This software package for lighting control event scheduling is called Event Manager. This software requires a SQL Server for operation connected to the lighting control system via the Ethernet Interface Module.

D. BACnet Interface; Cooper Lighting Solutions Model ProtoNode FPC-N34:

1. The Room Controller network shall permit data proto col translation through a building automation interface Gateway. The BACnet Gateway shall permit BACnet communication protocol to operate individual relays, relay groups and read the status of those relays. The Room Controller network shall respond efficiently to the requested information from the BACnet network.

2. The ProtoNode provides up to 10,000 points of control and can communicate to multiple panel types.

3. Provide PIC list definition and object model to other system manufacturers.

E. LonWorks Interface; Cooper Lighting Solutions Model FPC-N35:

1. Provide ability to communicate by means of LonWorks FTT-10 communication to centralized lighting system from user-supplied LonWorks FTT-10 twisted pair network.

2. The Room Controller network shall permit data protocol translation through a building automation interface Gateway. The LON Gateway shall permit LonWorks communication protocol to operate individual relays, relay groups and read the status of those relays. The Room Controller network shall respond efficiently to the requested information from the LonWorks network.

3. The ProtoNode provides up to 4,096 points of control and can communicate to multiple panel types.

4. Provide LonWorks interface object model specification to secondary equipment manufacturers.

F. The Room Controller Network has several other lighting control panels types that may be utilized to enhance your lighting control application. At least one ControlKeeper® lighting control panel must exist on a Room Controller network.

1. ControlKeeper® TouchScreen (CKT)

a. The CKT shall provide additional flexibility by providing up to 48 - 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CKT controllers, although accessible through the network, shall be fully stand-alone in their control capability. The CKT provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide thirty-two, 3-wire or 2-wire dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide four analog inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 128 additional global commands for network control and shall reside in the CKT. Networks that rely on a single time clock for system operation shall not be acceptable.

2. ControlKeeper® 4A (CK 4A)

a. The CK 4A shall provide additional flexibility by providing four 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 4A shall optionally provide four,
0-10VDC outputs to control dimming ballasts. The CK 4A controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 4A provides full status indication of CPU status, network communication, power and HOA overrides. The controller shall provide four, 3-

wire or eight, 2-wire dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide four analog inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 4A. Networks that rely on a single time clock for system operation shall not be acceptable.

3. ControlKeeper® 4 (CK 4)

   a. The CK 4 shall provide additional flexibility by providing four normally open or normally closed 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 4 controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 4 provides full status indication of CPU status, network communication, power and HOA overrides. The controller shall provide four dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 4. Systems that utilize the parent child topology shall not be acceptable.

4. ControlKeeper® 2 (CK 2)

   a. The CK 2 shall provide additional flexibility by providing two normally open or normally closed 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 2 controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 2 provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide two dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 2. Systems that utilize the parent child topology shall not be acceptable.

2.14 OPENADR VIRTUAL END NODE (VEN) FOR DEMAND RESPONSE

A. The Room Controller shall be capable of receiving a signal from a Demand Response or OpenADR Virtual End Node device. When received the Room Controller will automatically adjust lighting to provide optimal energy savings and comply with Demand Response code requirements. Systems that do not support Demand Response capability out-of-the-box shall not be acceptable.

   1. Automatically adjust the target lighting level by at least 15% but not more than 50%.

   2. System does not permit user override of the Demand Response system except in the cases of emergency or normal power loss. Systems that allow the user to adjust the lights higher than the demand response target light level shall not be acceptable.

3. Each Room Controller shall be configurable for individual Demand Response reduction levels. Systems that only support global Demand Response reduction levels shall not be acceptable.

B. Cooper Lighting Solutions Catalog Number:

1. [EBOX-2B-DC], [EBOX-ASF]

2.15 EMERGENCY LIGHTING

A. Room Controller with emergency relay – The Room Controller is a UL 924 listed device that monitors normal power circuit to the Room Controller. The Room Controller has a dedicated UL 924 output which includes emergency power line in and emergency power load out connections. The UL 924 relay will track with output 1 (Yellow) during normal power operations. Upon loss of normal power the UL 924 output will force the emergency lighting On and full bright (if dimming) until normal power is restored. Features include:

1. 120-277VAC, 50/60 Hz, 3 amp ballast rating.

2. Laddarless testing: Push the “All Off” button on any wallstation four times [e-mer-gen-cy], will turn off normal lighting and force UL 924 emergency output On and full bright.

3. Auxiliary input for remote Alert Mode (All On, and full bright).

B. Emergency Power Control – A UL 924 listed device installs down line of an output that monitors a switched or dimmed circuit providing normal lighting to an area. The unit provides normal ON/OFF or 0-10V dimming control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120-277 volts, 50/60 Hz., 20 amp ballast rating.

2. Push to test button.

3. Cooper Lighting Solutions Catalog Numbers:

a. [CEPC-1] (switching)

b. [CEPC-1-D] (0-10V dimming)

PART 3 EXECUTION

3.01 INSTALLATION

A. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits.

B. All low voltage smart devices shall connect using QuickConnect wire provided by Cooper Lighting Solutions. When using wire for connections other than the QuickConnect low voltage wire (pre-defined lengths of RJ45 cable), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contractor termination

requirements.

C. Install the work of this Section in accordance with manufacturer’s printed instructions unless otherwise indicated.

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.).

3.02 PRODUCT SUPPORT AND SERVICE

A. Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment.

3.03 FACTORY COMMISSIONING

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with twenty one working days written notice of the system startup and adjustment date.

C. 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.

END OF SECTION 26 09 26

SECTION 26 09 27
STAGE LIGHTING CONTROL SYSTEMS

PART 1

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes equipment for a lighting control system including relay/dimmer panels and controls.

1.03 SUBMITTALS

A. Product Data: For control systems, including dimensions and data on features and components. Include data on ratings and features of devices.

B. Shop Drawings: Details showing arrangements, characteristics, and circuit assignments of various modules. Include elevation views of front panels indicating devices and controls. Include illustrations and dimensioned drawings.

1. Wiring diagrams: Detail wiring for power and control systems and differentiate between manufacturer and field-installed wiring.

C. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: Provide operating manuals, instructional videotapes, and controls to be included in maintenance manuals specified in Division 1.

F. Record Data: Show connections and circuit and channel assignments.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has installed systems of similar scope and function as the units required for this project.

B. Manufacturer Qualifications: A firm experienced in manufacturing equipment similar to that indicated for this project that maintains a factory technical support service group. The firm shall be capable of providing the user with training, parts, and emergency maintenance and repairs support within 48 hours.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. Comply with NFPA 70.

1.05 BASIS OF DESIGN

A. Basis of system design will be Lehigh Electric Products Company, Allentown, PA., and its standard products. All other manufacturers wishing to bid shall submit equal product with all supportive documents 10 days prior to bid date for approval to bid. Failure to do so shall disqualify all unapproved bidders.

PART 2

2.01 FIXTURES

A. General: Listed under UL 1573.

1. Standard Features: Equip each fixture with pigtail, yoke with pipe clamp, and safety cable for batten mounting, and filter holder. Cables to be provided as shown under “DMX and Power Cables”, below.

B. Ellipsoidal Spotlights - LED: Warm white 3K, 230W LED fixture with 8 or 16-bit DMX control of intensity and color.

1. Housing: Die-cast aluminum and sheet metal housing construction. Tool free interchangeable barrels.360-degree rotating barrel. Approximate weight of 26 pounds.

2. Light Engine: Warm white 230 watt; 50,000-hour LED Life.

3. Lenses: Heat resisting plano-convex lenses. Fixed and variable focus available.

4. Body and cable finish to be WHITE.

5. Rating: 100-240volt 50/60Hz Universal Power Input. Electrical & Data: PowerCon® in and out connections. 5-pin DMX in and out. Requires power from non-dim source.

6. Compatible with DMX, Artnet, sACN, and RDM protocols.

7. Shutters: Four .037” stainless steel, fully adjustable and lockable. Constructed with oversized heat resistant handles.

8. Completely enclosed accessory holder.

9. Fixture to be complete with 6’ power cord, safety cable, yoke and c-clamp.

10. Whisper quiet fan cooling for operation within a 10ºC to 40ºC range. IP-20 rating for dry location use.

11. Fixture to be MET listed and labeled.

12. Provide: 12 – Lehigh E-260WW with 26 degree lens. Locate where shown on plans.

C. Wash Lighting – LED: 5 Color RGBA-L, 620W LED fixture with 8 or 16-bit DMX control of intensity and color.

1. Housing: Die-cast aluminum and sheet steel construction.

2. Light engine: Five color RGBA-L LED wash light.

3. Lens: 20º x 50º beam angle optics with filter installed.

4. Body color: Black

5. Rating: 100-240volt 50/60Hz Universal Power Input. Electrical & Data: PowerCon® in and out connections. 5-pin DMX in and out. Requires power from non-dim source.

6. Compatible with DMX, Artnet, sACN, and RDM protocols.

7. Fixture to be complete with 6’ power cord, safety cable, yoke and c-clamp.

8. Whisper quiet fan cooling for operation within a 10ºC to 40ºC range. IP-20 rating for dry location use.

9. Fixture to be MET listed and labeled.

10. Color temp: 2800K - 6500 K color temperature.

11. Dimensions: 70” L x 8” H x 8” D.

12. Supplied with 6’ power and 5’ DMX cable, safety cable, yoke, and c-clamps.

13. Lux: 2320 lux @ 5 meters with filter installed. 620 watts.

14. Provide: 10- Lehigh Ovation B-2805FC LED borderlights. Locate where shown on plans.

D. DMX and power cables. Provide fixture DMX and power cables in the following types and quantities:

1. 12 – 5’ five pin XLR cables, IP22 rated, M/F cable ends. WHITE finish.

2. 10 – 5’ five pin XLR cables, IP22 rated, M/F cable ends.

3. 8 – 5’ Powercon to Powercon cables, IP22 rated, M/F cable ends. WHITE finish.

4. 4 – 5’ Powercon to Powercon cables, IP22 rated, M/F cable ends.

5. 2 – 15’ Powercon to Edison cables. IP22 rated, M/F cable ends.

6. 2 – 25’ Powercon to Edison cables. IP22 rated, M/F cable ends.

2.02 DISTRIBUTION COMPONENTS

A. Receptacle Plug-In Boxes

1. Box: Welded steel, minimum of 16 gauge, with removable cover.

2. Receptacles: One flush mount 5 pin XLR DMX receptacle.

3. Receptacles Rating: DMX 5-pin XLR style.

4. Mounting: Pipe mount at locations show on plans.

5. Finish to be WHITE.

6. Provide: 4 – LEPB-P-DMX

B. LED Stage Light Protective Fixture Cage.

1. Frame: Welded steel, minimum of ¼" steel angle iron.

2. Side panels: ½" expanded metal welded to sides.

3. Front panel: 2x4 wire mesh weld to hinged locking door.

4. Fixture support: 1 ½" pipe mounted inside cage from side to side to mount LED Stage fixtures, DMX receptacle box, and E-Flex 4 Stage panel.

5. Mounting: Mounted by top rails using threaded rod, pipe, Unistrut, or direct to overhead joists.

6. Finish: Powdercoat WHITE finish.

7. Provide: 2- Lehigh PSC6L-WH. Locate where shown on plans.

Note: Cages made with plastic covered cables as wire mesh and that do not employ hinged locking doors will not be considered equal.

C. Multi-port RDM/DMX Splitter.

1. Ports: Available in 4, 8, 12, 16, and more output ports.

2. Box: Welded steel, minimum of 16 gauge, with removable cover.

3. Power: Requires 120V input for on-board power supply.

4. Protection: 3750V opto-isolation.

5. Short circuit protection with aut-reboot.

6. Provide: 1- LRDMDMXS-4 RDM/DMX splitter. Locate as shown on plans.

2.03 LIGHTING CONTROL SYSTEM

A. Description: Microprocessor-based system consisting of relays, control modules, and remote stations.

1. UL and cUL LISTED (508 and 924).

2. Comply with USITT DMX 512-A for data transmission (ANSI E1.11-2008 and ANSI E1.20-2010).

B. E-Flex 4Stage Panel

1. Description: Microprocessor-based, modular system consisting of relays, control modules, and remote stations.

a. UL and cUL LISTED (508 and 924).

b. Comply with USITT DMX 512-A for data transmission (ANSI E1.11-2008 and ANSI E1.20-2010).

2. Cabinet:

a. Mechanical:

1) Cabinets shall contain 4 relay-controlled circuits plus optional 0-10V dimmer control.

2) 18 GA steel, surface mounted, NEMA 1, IP20 rated panel with a removable screw cover. Textured, black powder coat finish.

3) Provide a removable interior shield that covers all line voltage components. When the cabinet's cover is removed, only the class II low voltage components will be accessible.

4) Optional, movable voltage barriers for separation of adjacent circuits with voltage differentials or providing emergency lighting.

5) Dimensions: E-Flex 4S: 9.5" H x 12" W x 3" D.

6) Mounting brackets for attaching c-clamps or U-bolts for pipe mounting.

7) DMX in and out receptacles with DMX pass-thru operation (Optional wireless DMX is available.)

8) Four flush mounted power output receptacles.

(a) Each receptacle shall provide the full output of one relay.

(b) Receptacle options shall include PowerCon or parallel blade as scheduled.

9) One strain relief grip for the incoming power cable.

b. Electrical:

1) Universal input voltages: 90V to 277V AC and 47 to 63Hz. UL/cUL 508 and 924 listed.

2) Power connection: 4 – 20A, 3W feeds.

3) Contractor to provide a grid junction box for each EF4S panel with terminals for contractor termination.

4) Contractor to provide a flexible cable connection consisting of nine 12Ga wires in an SO jacket with sufficient length to interconnect the grid-junction box to the EF4S panel. Cable assembly to include strain relief connectors as needed.

c. Environment:

1) Ambient temperature operating range from 0ºC to 40ºC.

2) Indoor use only.

d. Relays:

1) Single pole, mechanically held, latching style rated relays rated for 120V to 277V operation.

2) Each relay includes an LED status indicator and an integral manual operation switch.

3) Relays must maintain their control setting upon loss of power.

4) Relays must be UL rated for use with electronic ballasts (EB rated).

5) Minimum load type power ratings in the 120V to 277V operating range: Electronic ballast: 16A, Tungsten: 20A, Standard ballast: 20A or Resistive: 50A.

e. Control Input: DMX/RDM via wired or optional wireless input.

1) Configuration:

(a) Set the start address via rotary switch or using RDM, user interface, or PC application software.

(b) A DMX address shall be configurable to any zone. Selected zones may be excluded from DMX configuration.

(c) c. Set DMX signal loss response action.

(d) DMX signal control passes thru to control additional e-Flex panels or DMX devices.

2) Device requirements

(a) 1.5kV optically isolated RDM (ANSI E1.20) input with fault tolerant input protection and PTC resettable fuse over-current protection.

(b) Un-buffered thru connection provided will not affect communication if relay panel loses power or fails.

(c) Slide switch to enable/disable end of line termination.

f. Provide: 4- Lehigh E-Flex 4 Stage panels. Two shall have WHITE finish for cage mounting front of stage. Two shall have black finish for mounting on light pipes over the stage.

Note: Grouping individual single circuit relay pucks shall not be considered as equal.

C. Stage Manager's Panel: Surface mounted steel cabinet with a hinged locking cover and a painted finish. Mount on the stage area as shown on the drawings. Panel to include a DTM-TS Series self-contained, programmable dimming controller.

1. Mechanical:

a. Faceplate to be aluminum with no visible fasteners and available in a black, white, or beige painted finish.

b. Station shall include a 7”, 800 X 480 pixels, color LCD display with LED backlighting providing touch interface operation.

1) Display to include adjustable brightness control.

2) Display automatically dims to a reduced level and/or displays a preselected idle screen when the station has been inactive over a user programmable period.

3) User selectable screen color and configuration options.

4) Cleaning mode to disable the display screen for 15 seconds.

5) Tab based user interface for quick, easy to navigate control operation.

c. Station shall operate using a graphic user interface with the control features (buttons, faders, etc.) graphically displayed on the LCD. Station display shall not include any mechanical switches, potentiometers, or similar mechanical devices.

d. Control wiring: 2 shielded pair (Belden 9729).

e. Infrared receiver for wireless preset control using the optional SWC hand-held controller.

f. Each DTM-TS series master station requires a 24V DC power input.

1) USB port: Station control settings shall be user programmable using a PC based software system to provide off-line editing of the control settings and labels

g. DMX in and DMX out ports for DMX capture operation.

h. The DTM-TS accepts two direct control inputs from occupancy sensors, photocells, building management, or fire alarm systems plus additional inputs via the system data link. Inputs are assignable to control any of the following

functions: room combine, fire alarm by-pass, activate a preset, lock/unlock stations, and activate timeclock lights-out warning.

2. The master station shall provide the following control functions:

   a. Playback up to 24 control actions which are any combination of control functions and up to 18 presets.

      1) Record 18 presets plus Full and Off with no external controls required to set or store presets.

         (a) Presets are programmed setting the channel controllers to the required control levels and recording those settings to a preset. Presets may be modified and copied to another preset.

         (b) Full: Fades all channels to user programmable levels over a user selected fade time.

         (c) Off: Fades all channels to blackout over a user selected fade time.

         (d) Each preset to have a programmable fade time from 0 seconds to 60 minutes with the active fade time indicated in the display. Repressing the preset button accelerates an active fade.

      2) Control features include Lock remotes, Shade control, Partition control, Auto-sequence control, and Timeclock lights out control operations.

   b. Control one DMX universe (512 channels) per master station.

   c. Channel level controllers set each channel's level using a virtual slider.

      1) Each channel slider includes the channel name, a numerical control level, and a level display.

      2) Channel level intensity may be adjusted by touching the slider at the current control level and sliding your finger up or down to set the desired level or instantly changed by touching the slider scale at the desired level.

      3) Channels may be viewed by pages in groups of 10 channels.

      4) Channel controllers provide temporary, manual control of an active preset. The changes are not permanent unless stored.

   d. Control channel options:

      1) Incandescent - standard forward phase dimming

      2) Non-dim control

      3) Fluorescent – control of forward phase fluorescent ballasts

4) Multi-color LED control: Fixtures with multi-color LEDS (RGB, etc.) are controlled with the DMX output using discrete controllers or the color mode option.

(a) Discrete controllers option programs a separate controller (DMX channel) to each color in the controlled fixture.

(b) Color mode assigns the RGB color mixing for a fixture, or group of similar programmed fixtures, to one station channel.

(1) The channel controller provides intensity control of the RGB.

(2) A color palette display provides for the selection of the RGB color with two additional controllers to add two additional colors to the RGB mix.

(3) LED control includes DMX patching.

(4) The color mode color and channel intensity settings may be recorded to a preset.

e. Master controller adjusts the channel levels in an active preset. The override is temporary and does not change the preset levels stored in memory.

1) The Master controller proportionately raises or lowers all channels in an active preset.

2) All channels are programmable to master or non-master control operation. Only channels set to master control are controlled by the Master controller.

3) Station control and programming functions are accessed using a station menu function. No external controller or computer shall be required. Programmable settings shall include:

(a) System control settings including the SDE-LCD station control functions and partition configuration.

(b) Channel dim/non-dim/fluorescent/LED control operation, high/low level trim settings for each channel, and DMX patching of one DMX universe to the 512 station channels.

(c) Preset and channel names.

(d) Preset fade times from 0 seconds to 60 minutes.

(e) Lock or unlock the station memory, access to the station operation, and remote entrance stations. Lock function is secured by an access code.

(f) Clean function to allow cleaning the station LCD display without impacting active light settings.

(g) Configure timeclock settings, auto-sequence settings, and assign control input functions for occupancy and daylight harvesting sensors, lock remote stations, partition wall operation, shade control, emergency response, and presets.

f. All stored control data and settings shall be retained indefinitely if power is lost using non-volatile ferroelectric RAM. The station shall return to the previous control status once power is restored.

g. Auto-sequence mode for timed playback of preset groups.

h. Astronomical timeclock function with up to 25 events and 25 holidays to activate presets, enable/disable occupancy sensor control operation, enable/disable photocell control operation, and activate the lights- out warning alert function operation (flashes lights prior to their going off when triggered by a timeclock setting).

i. Presets may activate the S-MIO module's programmable outputs to control external devices.

j. Master stations with no entrance stations or control interface modules on the control link shall be capable of the direct control of DMX based fixtures or devices without the S-DOI module.

k. DMX capture mode.

l. Station shall accept a DMX in signal from an external DMX device and 'capture' the current DMX levels for future recall by the DTM-TS station.

1) Station shall automatically sense a DMX input signal and display a 'Capture' button on the station display. In capture mode, the current DMX values may be stored to any of the station's presets.

2) Station shall include an RDM thru feature, which allows the input console to interface with any RDM devices downstream of the station.

m. The 'grouping zone' feature allows selected channels to be controlled as a group, including intensity and color settings. Touching any grouping mode channel will proportionately raise or lower all grouping mode channels. The Master controller will also control the grouping mode channels when operated.

n. Wireless mobile app that permits system control using iOS or Android based phones and tablets.

1) Operation requires a Solitaire S-Com control module and a wireless access point router.

2) Control features to be included:

(a) Recall and activate all STM and DTM master presets, virtual button control features (partition control status, remote station lock/unlock, auto-sequence operation mode, and shade control) plus Full, and Off. The controller shall display all preset and virtual button names.

(b) Master raise/lower control of the active preset.

(c) Set and record selected channel levels in a preset.

(d) Select and record color selections and control levels of RGBXY fixtures using the master station color mode function. RGB color selection provided using either the scroll or color palette function with additional colors added and controlled via the color mode function.

(e) System to control up to 8 areas.

3) System shall be user name and password protected with a maximum of three simultaneous users per system S-Com.

o. Provide: 1- DTM-TS DMX master station mounted in a wall-mounted enclosure with a hinged locking cover. Locate where shown on plans.

D. Lighting Control Console: Lehigh Zero 88 FLX-S24 1U Series with 22” Flat Screen.

1. DMX RGB style digital control console with the following features:

a. Control of 48 fixtures including multi-color LED, moving lights, and halogen.

b. 24 multi-function faders.

c. 48 playbacks, each with a submaster and full cue stack

d. 48 groups, 4 x 48 palettes, color, beam shape, position, & effect

e. Wi-Fi Remote monitor operation via Zero 88 Remote Monitor program

f. Multi-touch operation for color and moving lights

g. Dedicated large GO button & playback faders for standard theatre control

h. Hands-on intuitive control via 4 easy to use encoder wheels

i. Multi-lingual step-by-step touch screen guidance and HELP menu built in

j. Art-NET and sACN for network output and wireless connection to smart phone / remote monitor

k. Built-in 7” full color full function touch screen for programming and playback

l. Automatic groups, palettes, effects, and Marcos for easy programming

m. Color picking, mixing, and image capture made easy on touch screen

n. Color gel mood board as authored by Lee Filters

o. Additive, subtractive, and HSV control

p. Store single or multi-cues on each of the playbacks for simple pre-recorded recall

q. Built-in updatable fixture library

r. Fully RDM compatible

s. Showfile sharing with other Zero 88 control consoles

t. Quite fan free convection cooled

u. One DMX universe standard, easily upgraded to two DMX universe by the end user

v. Two XLR DMX outputs

w. 10,000 on-board cues

x. Two USB ports for use in off-loading shows, uploading free updates

y. Free Zero mobile App connectivity for use with smart phone for wireless operation

2. Provide: 1- Zero 88 FLX-S24 1U DMX console with storage/carry case and (2) 25’ DMX cables.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install equipment according to the manufacturer's written instructions. Set permanently mounted items plumb and level and square with ceilings and walls.

B. Mounting of Equipment: Conform to manufacturer's instructions and Division 16 Section "Supporting Devices." Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounted ones.

3.02 CONTROL WIRING INSTALLATION

A. Install wiring between control devices as specified in Division 16 Section "Wires and Cables" for hard wired connections. Install wiring in raceway except cable and plug connections.

B. Wiring in Enclosures: Bundle, train, and support.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Arrange and pay for the service of a factory-authorized service representative to test, adjust, and program the lighting control system.

1. Schedule visual and mechanical inspections and electrical tests with at least 14-days advanced notification.

B. Electrical Tests: Perform according to manufacturer's instructions. Exercise caution testing devices containing solid-state components.

3.04 CLEANING AND ADJUSTING

A. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars of finish to match original finish. Clean fixtures, devices, and equipment internally and externally using methods and materials as recommended by manufacturers.

3.05 DEMONSTRATION

A. Demonstrate the system to prove compliance with requirements.

B. Direct Training: Arrange and pay for the services of a factory-authorized service representative to demonstrate lighting control system and train Owner's personnel.

1. Conduct a minimum of 1 day of training in operation and maintenance as specified under "Instructions to Owner's Employees" in Division 1 Section "Project Closeout."

2. Schedule training with at least a 14-day advance notification.

3.06 COMMISSIONING

A. Operational Tests: Energize lighting controls systems, program controls, and check controlled outlets for light levels.

B. Correct deficiencies and retest deficient items. Verify by the system tests that specified requirements are met.

END OF SECTION 26 09 27

SECTION 26 22 13
LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

1.03 ACCEPTABLE MANUFACTURERS

A. Only provide transformers that meet the requirements described in 1.03 B and 1.03C for this section specification, these requirments to supersede any requirements noted on floor plans, details or risers.

B. 3-Phase, 15kVa and larger use Harmonic Mitigation Transformers (HMT)

1. Powersmiths Internaonal Corporaon - T1000 OPAL Series
2. Power Quality International - DV-Z4 Series.
3. Hammond Power Solutions - ULL-XX-H1E Series.

C. Single Phase or 3-Phase below 15-kVA General Purpose Transformers.

1. Schneider Electric - Square D

PART 2 – PRODUCTS

2.01 STANDARD DRY TYPE TRANSFORMERS – ULTRA EFFICIENT

A. GENERAL: Provide U. L. labeled, plated copper wire wound, two winding type units, NEMA 2 indoor and NEMA 3RX construction for outdoor. Refer to Drawings for ratings. All standard transformers shall be Ultra Efficient type. Minimum transformer ratings shall be 30VA and K-13 rated. Energy efficiency shall exceed DOE 2016 requirements on average by 20% for combined no-load, linear loads, and non-linear loads between no-load and 50% loading for an estimated pay-back of less than 5-years

B. TEMPERATURE RISE: Design shall use 220° C insulation and operate with a maximum temperature rise of 115° C above a 40° C ambient.

C. TAPS: High voltage windings shall be provided with two 2½% taps FCAN and four 2½% taps FCBN.

D. NOISE: The manufacturer shall properly isolate the core and coil from the enclosure with vibration isolation pads in order to minimize the transmission of vibration and noise. Noise levels shall be 3dB below NEMA ST-20..

E. Identification: Install lamacoid nameplate with 5/16" letters on front face showing transformer name and voltage. Attach with mastic and two screws. Coordinate to give same name as shown on drawings. Example:

1. Transformer XL 45 KVA

2. 480V-208Y/120 Volts, 3 Phase, 4 Wire

F. MANUFACTURERS: Powersmiths (E-Series), PQI (EII E-Rated), Mirus (ULLTRA)

2.02 HARMONIC MITIGATING TRANSFORMERS

A. GENERAL: Provide U. L. labeled, three phase common core, copper wound, two winding type units, NEMA 2 indoor and NEMA 3RX outdoor construction suitable for location installed. Refer to Drawings for ratings. Minimum transformer ratings shall be 15KVA and K-13 rated. Energy efficiency shall exceed DOE 2016 requirements on average by 20% for combined no-load, linear loads, and non-linear loads between no-load and 50% loading for an estimated pay-back of less than 5-years

B. CORE DESIGN: Design shall minimize third harmonic current through secondary flux cancellation to reduce fundamental current imbalance. Secondary winding shall have less than 0.3% zero sequence reactance and low zero sequence impedance. Provide electrostatic shield. Overall design shall meet the efficiency requirements of Candidate Standard Level 3. Provide units with 30□ phase shift unless two or more transformers are served from the same distribution panel. Then provide a mix of 0□, 15□ and 30□ phase shift transformers.

C. TEMPERATURE RISE: Design shall use 220° C insulation and operate with a maximum temperature rise of 115° C above a 40° C ambient.

D. TAPS: High voltage windings shall be provided with two 2½% taps FCAN and four 2½% taps FCBN.

E. NOISE: The manufacturer shall properly isolate the core and coil from the enclosure with vibration isolation pads in order to minimize the transmission of vibration and noise. Noise levels shall be 3dB below NEMA ST-20.

F. Identification: Install lamacoid nameplate with 5/16" letters on front face showing transformer name and voltage. Attach with mastic and two screws. Coordinate to give same name as shown on drawings. Example:

1. Transformer XL 45 KVA

2. 480V-208Y/120 Volts, 3 Phase, 4 Wire

G. MANUFACTURERS: Power Quality International, Powersmiths T1000 OPAL, Hammond Power Solutions.

2.03 NAMEPLATES

A. In addition to the nameplate specified with the various equipment, provide the following engraved lamacoid nameplate with 5/16" high letters:

CAUTION DO NOT OPEN WHILE ENERGIZED THIS EQUIPMENT IS POWERED FROM PANEL DA.

Replace PANEL DA with the actual device as shown on the Drawings.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

B. 6" clearance from wall surfaces.

C. 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.

3.02 EQUIPMENT PADS

A. Provide 4" thick concrete pad for each unit. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge. Rubber vibration isolators.

END OF SECTION 26 22 13

SECTION 26 24 13
SWITCHBOARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 SWITCHBOARDS

A. GENERAL: Universal building type switchboard fabricated in accordance with NEMA standards. Switchboards and circuit breakers shall be listed for use with 75 degrees C wiring.

B. CABINETS: All switchboards 1600 amp and larger shall be totally enclosed free standing circuit breaker type switchboards as shown on the electrical drawings. The switchboard framework shall be formed code gauge steel, rigidly welded and bolted together to support all cover plates, bussing and component devices during shipment and installation. Each switchboard section shall have an open bottom and removable top, front and side plate. All circuit breaker connections shall be front accessible. The paint finish shall be gray enamel over a rust-inhibiting phosphate primer.

C. BUSSING: The switchboard bussing shall be fully rated and silver plated copper and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum average temperature rise of 65degree C, above an ambient temperature of 40 degrees C. The main horizontal bus bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Belleville washers to be free of required periodic maintenance. Drill bus bars for future extension both directions. Provide a full-length ground bus in each cubicle.

D. SHORT CIRCUIT 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 all equipment can withstand the stresses of a fault equal to that of the least overcurrent protective device contained therein. Such rating shall be established by actual tests by the manufacturer on similar equipment construction as the subject switchboard. Busses shall be braced for a minimum of 50,000 amps symmetrical at 480V.

E. CIRCUIT BREAKERS: Circuit breakers shall be equipped with individually insulated, braced, and protected connectors. Tripped indication shall be clearly shown by the circuit breaker handle taking a position between ON and OFF. All circuit breakers shall have an interrupting rating as shown on the drawings. Circuit breakers through 600A shall be Schneider Electric - Square D I-

Limiter type. Circuit breakers 1000A and larger shall be Schneider Electric - Square D Type SE with LSG trip.

F. ADJUSTABLE TRIP CIRCUIT BREAKERS:

1. GENERAL: Breaker size 200A and larger shall have adjustable trip circuit breakers manufacturer shall provide system coordination study with recommended settings as part of electrical switchgear submittal for engineer review.

2. INSTALLATION: Contractor shall notify Owner when adjustable trip settings are installed for each adjustable trip circuit breaker. When adjustable trip settings are preset from the factory the contractor shall provide written documentation certifying that all adjustable trip settings have been set in accordance with the system coordination study.

3. CLOSEOUT DOCUMENTS: Provide system coordination study and installed trip settings with O&M Manuals for each adjustable trip circuit breaker.

4. WARRANTY: During the warranty period the contractor shall provide and install new adjustable trip settings as required at no cost to the owner.

G. INSTRUMENTATION: Provide Schneider Electric - Square D Powerlogic Model CM4250 monitoring system sensing the entire switchboard. The display shall be mounted no lower than 45” nor higher than 72” above the concrete pad. The monitoring system shall provide readouts for current-per-phase, phase-to-neutral voltage, phase-to-phase voltage and have waveform capture. System shall store historical information of these values for the past seven days. System shall have optical port for downloading information to a computer as well as having a method of connecting a remote computer for real time monitoring system. Factory representative shall set up meter per the Engineer’s direction and include two site visits during the warranty period (as needed) to assist in analyzing power quality problems. Provide BACNET interface to export current, voltage, KVA and KWH information to the building energy management system.

1. Communication:

a. Front mounted RS232 port and dual rear mounted RS485 ports.

b. ModBus RTU protocol.

H. POWER LOSS MONITORS: Provide power loss phase monitor for each of three phases in the main electrical switchboard. Provide 1” empty conduit with pull string from switchboard to nearest ceiling cavity for security alarm motoring cables to connect to phase loss monitor. Security contractor shall provide three security relays and cables from school security alarm panel to the phase loss monitor for monitoring in main switchboard.

I. SUPPRESSORS: Provide Schneider Electric - Square D Model SP3650 lighting surge suppresser with capacitor. Provide Schneider Electric - Square D Model IMA240 TVSS (rated for 240kA) with dry contacts and surge counter. Equipment shall be mounted in the switchboard.

J. NAME TAGS:

1. Identify each device, space and meter with an engraved lamacoid nameplate (5/16" high letters) showing equipment served and trip setting or space size. Attach nameplates with

mastic and two sheetmetal screws.

2. Provide a master nameplate on switchboard stating:

   Switchboard M
   480Y/277V, 3 Phase, 4 Wire
   Main Buss: 2000 amps braced for 50,000 amps symmetrical
   Date Insatlled

K. COORDINATION STUDY: Manufacturer shall provide system coordination study with recommended settings of adjustable circuit breakers to ensure downstream circuit breakers will operate before distribution breakers. Provide study after main feeder length information is provided by the electrical contractor. Provide adjustable breakers as necessary for complete coordination of overcurrent protection.

L. ACCEPTABLE MANUFACTURERS: Schneider Electric - Square D

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

3.02 EQUIPMENT PADS

A. Provide 4” thick concrete pad for each unit. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge.

B. The housekeeping pad shall extend 3" beyond the housing of the switchboard.

END OF SECTION 26 24 13

SECTION 26 24 16
PANELBOARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 LIGHTING PANELS

A. GENERAL: Circuit breaker type; Schneider Electric - Square D Type NQOD for 120/208-240 Volts, NF for 277/480 Volts. Construction shall comply with NEMA and U. L. Standards. Panels and circuit breakers shall be listed for use with 75□ C wiring. Mount panel with top of can at 72" above finished floor.

B. CABINETS: Safety dead front type with front hinged trim to box with full length piano hinge and quarter turn fasteners; box made of code gage galvanized steel; provide wire bending space per NEC Table 373-6; door with flush type combination lock and latch, all keyed alike. For kitchen panels, provide recessed stainless-steel box and trim.

C. CIRCUIT BREAKERS: Plug in for 120/208-240 Volts, bolt in for 277/480 Volts; quick make, quick break, trip free, thermal magnetic trip; automatic tripping indicated by handle at midpoint position; multi-pole breakers to have common trip (handle ties are not acceptable). Minimum interrupting ratings shall be 14,000 Amps symmetrical at 277/480 Volts and 10,000 Amps symmetrical at 120/208-240 Volts. All main circuit breakers shall be rated minimum the equivalent of the panelboard rating. Ratings as scheduled on drawings. Schneider Electric - Square D I-line construction with plug on breakers is acceptable for 277/480 Volts. Install circuit breakers in same order as shown on the drawings. Where spaces are noted, provide bus connectors and all other provisions necessary to add future breakers of any size and number of poles up to 100 amp and three poles.

D. BUSSING: Silver plated copper sized in accordance with NEMA temperature rise standards and installed completely throughout panel for installation of future breakers where schedule shows space only. Lugs U. L. rated for Cu/Al terminations. Ground and neutral bus bars to be silver plated copper. Unless indicated otherwise on drawings, bus bracing shall be minimum 10,000 Amps symmetrical for 120/208V equipment and 14,000 Amps for 277/480V equipment. Provide a ground bar in the Service Entrance Equipment and in each electrical panel having a branch circuit ground wire. All bussing shall be fully rated. Panelboards serving non-linear loads and fed with neutrals greater than 100% shall have 200% neutral bussing and isolated ground bus.

E. SURGE SUPPRESSION: Panels noted to have TVSS surge suppression shall include TVSS externally mounted and wired to 30A/3P circuit breaker in panel.

F. DIRECTORY: Complete at end of job, typewritten, stating equipment or actual room number served by circuit. Type even circuits on right side of card, odd on left side.

1. Note: None shall be labeled “Existing”. All to be verified and properly labeled.

G. FINISH: Gray enamel over rust inhibiting treatment after fabrication and before assembly. After installation, and before acceptance by the Owner, assembly shall be painted with a rust inhibiting paint (color selected by Architect). Recessed cans may have galvanized finish. Kitchen panels shall be unpainted, stainless steel.

H. NAMEPLATE: Provide lamacoid nameplate with 5/16" letters on front face showing panel name and voltage. Attach with mastic and two screws. Coordinate to give same name as shown on panelboard schedule. Example:

Panel LA 225 MCB
120/208 Volts, 3 Phase, 4 Wire

I. ACCEPTABLE MANUFACTURERS: Schneider Electric - Schneider Electric - Square D.

2.02 DISTRIBUTION PANELS

A. GENERAL: Construction in accordance with NEMA standards. Panels and circuit breakers shall be listed for use with 75□ C wiring.

B. CABINETS: Panelboard assembly shall be safety dead front type, enclosed in a code gauge steel cabinet with removable end walls. Fronts shall be of code gauge, full-finished steel with rust-inhibiting primer and baked enamel finish. Provide locking door with front hinged trim to box with full length piano hinge and quarter turn fasteners unless panel is located in a mechanical room. Provide the largest cabinet available for the ampacity panel schedules.

C. BUSSING: Bus structure and main lugs shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 degrees C rise above ambient. Heat rise tests shall be conducted in accordance with Underwriters' Laboratories Standard UL 67. Busses shall be silver plated copper braced for the scheduled fault current (50,000 amperes minimum). Bussing shall accept the largest circuit breaker available for the ampacity scheduled even though only smaller size CB's are listed. Ground and neutral bus bars to be silver plated copper. Where space only is shown, bussing shall allow any combination of 1, 2 and 3 pole circuit breakers of various frame sizes. All bussing shall be fully rated. Panelboards serving non-linear loads and fed with neutrals greater than 100% shall have 200% neutral bussing and isolated ground bus.

D. CIRCUIT BREAKERS: Circuit breakers shall bolt in or have Schneider Electric - Square D I-Line plug on construction. Circuit breakers shall be equipped with individually insulated, braced, and protected connectors. Tripped indication shall be clearly shown by the breaker handle taking a position between ON and OFF. Trip ratings of the circuit breaker shall be as shown on the panelboard schedule. All spaces shown shall include all buss connectors and any other provisions necessary for future breaker additions. All main circuit breakers shall be rated

minimum the equivalent of the panelboard rating.

E. NAMEPLATES: Provide lamacoid nameplate for panel stating name, voltage, amps & bracing. Provide lamacoid nameplate for each device and space stating equipment served and trip setting. Attach with mastic and two screws.

F. ACCEPTABLE MANUFACTURERS: Schneider Electric - Schneider Electric - Square D.

2.03 NAMEPLATES

1. In addition to the nameplate specified with the various equipment, provide the following engraved lamacoid nameplate with 5/16" high letters on each lighting panel and distribution panel:

CAUTION DO NOT OPEN WHILE ENERGIZED THIS EQUIPMENT IS POWERED FROM PANEL DA.

Replace PANEL with TRANSFORMER as appropriate. Replace PANEL DA with the actual device as shown on the Drawings.

2.04 STUDIES PROVIED BY SWITCHGEAR MANUFACTURES:

A. GENERAL: All studies shall be prepared and sealed by a manufacturer’s professional engineer.

B. COORDINATION STUDIES: Provide coordination studies and recommend selecting and setting of circuit breakers for all switchgear and circuit breakers prior to submitting any switchgear for review and approval. Provide adjustable breakers as necessary for complete coordination of overcurrent protection.

C. SHORT CIRCUIT ANALYSIS: Provide short circuit analysis to determine short circuit rating of all electrical switchgear. Provide short circuit rating label on all electrical switchgear.

D. ARC FLASH STUDIES: Provide arc flash studies and arc flash rating and protection equipment label on all switchgear. Provide and affix arc flash label for each electrical Panelboard other switchgear.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

B. Circuit Arrangement: Arrange branch circuit connections to 3-phase lighting and appliance panelboards so that when two or three circuits are run with a common neutral, each circuit is connected to a different phase unless shown otherwise. Branch circuits shall be connected to the circuit breakers in the lighting and appliance panelboard to provide the best possible phase

balance, unless shown otherwise.

C. Panelboards not intended to be used as service entrance (SE) rated shall have the factory installed neutral to ground bonding screws and straps removed.

D. Spare Conduits: Provide (3) 1-inch and above accessible ceiling space and (3) 1-inch capped down to ceiling space on floor below for all recessed lighting and appliance panelboards sections and all ighting and appliance panelboards sections located above ground floor. Terminate spare conduits in junction box 18” above accessible ceiling close to panel area. Label cover as “not used” and include panel identification.

E. Conductors shall be connected in a neat and workmanlike manner. Branch circuit phase, neutral and ground conductors entering can shall be neatly bent to follow sides of can and neatly bent at 90 degree angle to final connection. Trim excess wire length. Conductors are not to be installed in a manner to cause insulation pressure against edges of metal parts or interior mounting bolts. Install numbered labels on breaker phase conductors near breakers. Panelboard interior / exterior is to be cleaned to like new condition upon completion of work.

F. Install ground bus for ground conductors. Ground conductors size #1 and larger are to be landed to can with mechanical lugs and not to ground buss. Secure lugs to can with bolts, nuts and lock washer. Self-tapping screws are not acceptable.

G. Install panels so that breaker number 1 is the top left breaker. Panel interiors shall not be installed where breaker number 1 is the bottom right breaker.

H. 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.

I. Label breaker mounting space with stick-on number labels.

J. Only manufacturer screws / bolts are to be used to secure dead fronts and covers. Use caution when power tools are used to secure screws / bolts.

K. Branch circuit wiring requirement for multi-section panelboards: no branch circuit conductors shall be running from one section of panel to another section of panel. Install conduit for home run circuits to the top or bottom of the section of panel where the circuit breaker for that particular branch circuit is located. Group and terminate all hot, neutral and ground wire for each circuit in the same section of the panel where the circuit breaker is located.

END OF SECTION 26 24 16

SECTION 26 27 26
WIRING DEVICES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 WIRING DEVICES

A. GENERAL: All devices must be suitable for use intended and have voltage and current ratings adequate for loads served. All devices shall have terminals designed for use with stranded wire. All receptacles shall have a grounded pole and green painted grounding screw. Grounded receptacles shall ground lug internally connected to mounting tabs. Wall outlets shall be color gray. Devices installed in or served through fire rated structures shall be fireproofed in a manner compatible with the U. L. fire rating.

B. ACCEPTABLE MANUFACTURERS: Catalog numbers listed below are Leviton, unless indicated otherwise. Hubbell is an acceptable manufacturer for ONLY the 20 amp GFCI blank Switch and the 20 am heavy duty simplex receptacle. Lutron is acceptable only for dimming devices.

C. WALL SWITCHES (mechanical, electrical and IDF rooms): (20 Amp/277 Volt) Leviton #1221-2X Industrial grade flush toggle switches, with mounng yoke insulated from mechanism, equipped with plaster ears, switch handle, back and side-wired screw terminals.

1. NOTE: The standard 277 wall switch is only for mechanical, electrical and IDF rooms. For other room wall switches, provide Digital Lighting Control System switches. See Lighting Control Specifications and Detail Lighting Control Drawing on the plans for Wattstopper or equal manufacturer’s low voltage light switch.

2. Single-pole, 120/277V, 20A switch: Leviton #1221-2X

3. Double Pole 120/277V, 20A switch: Leviton #1222-2X

4. Three-way, 120/277V, 20A switch: Leviton #1223-2X

5. Four-way, 120/277V, 20A switch: Leviton #1224-2G

6. Single-pole, 120/277V, 20A switch, red pilot light: Leviton #1221-PL

D. KEYED SWITCHES (Corridors): (20 Amp/277 Volt) Hubbell HBL1557L – G momentary single pole double throw low voltage key switch must compatible with the wattstopper standalone

lighting control system - Gray (Hubbell only) with 1209 key with each switch. Deliver all “keys” to Architect. See Lighting Control Specifications and Detail Lighting Control Drawing on the plans for equal manufacturer’s low voltage light switch.

1. Single-pole, 120/277V, 20A key operated switch: Leviton #1221-2KL

2. Two-pole, 120/277, 20A key operated, Leviton #1222-2KL.

3. Three-way, 120/277V, 20A key operated switch: Leviton #1223-2KL

4. Four-way, 120/277V, 20A key operated switch: Leviton #1224-2KL

5. Key switches shall be all keyed alike to match the Owner’s standard key system. Coordinate with owner.

E. MOMENTARY CONTACT: Leviton #5657-2, single pole double throw, center off, momentary contact, 277V, 20A.

F. CONVENIENCE OUTLET: (20 amp/125v/3 wire) Leviton #5362X. (Red if on generator):

1. Extra Heavy Duty, Tamper-Resistant, One-piece nickel-plated brass ground strap, oversized “bell” shaped ground contacts, along with nickel plated steel retaining shields.

G. GFI OUTLET: Leviton #7899-HGX (Extra Heavy Duty, Tamper-Resistant & White color), 10KA short circuit rating, nickel-plated brass ground strap, Green LED power indication, Red LED ground fault indicator, no power at face if reverse wired.

H. GFI outlets in the kitchen shall be Leviton #7899-HGX Gray only.

I. BLANK FACE GFCI: 20 A, 125/250V, grounded blank face GFCI switch: Hubble GFBF20GYL.

J. ISOLATED GROUND COMPUTER OUTLETS IN IDF/MDF ROOMS: (20 amp/125v/3 wire) IG8300 (Extra Heavy Duty, Tamper-Resistant & Orange color).

K. USB outlets shall be type A, either integral to the duplex 125-Volt receptacle or USB-A onlymulple USB-A outlet type. Verify use with PISD on a project by project basis.

L. Heavy-Duty Simplex: Single heavy-duty type receptacles, with green hexagonal equipment ground screw, with metal mounng straps, back wiring, black molded phenolic compound, NEMA configuraon as indicated.

1. 30A, 125V grounded single NEMA #5-30R: Leviton #5371 with #80728X cover plate

2. 30A, 250V, grounded, 3-wire, 2-pole NEMA #6-30R: Leviton #5372 with #80728X cover plate or weatherproof cover plate

3. 20A, 125/250V, grounded, 4-wire, 3-pole NEMA #14-20R: Hubbell #8410 with Leviton #84004-40 cover plate.

4. 20A, 125V, grounded, NEMA 5-20R, Leviton #5801W with Leviton #84004-40 cover plate

M. SPECIAL DEVICES: Refer to Drawings, all specification grade. Provide matching cord and cap.

N. PLATES: Provide Type 302/304 smooth stainless-steel plates for all devices; provide combination and/or gangable plates where adjacently located multi-outlet assemblies are indicated on drawings which shall include multi-switch installations. Plates for surface mounted switch or outlet boxes shall be Sierra galvanized steel handy box plates (H series). Mounting screws shall be stainless steel. Jumbo plates are not acceptable. For all receptacles covers as well as blank face gfci and blank face covers shall be permenetly asf engraved on the outside with circuit tag (example "LA-12"). Blank face to have engraving describing circuit number and what its serving (example "LA-12 REFRIGERATOR").

O. OUTDOOR COVERS: Electrical devices noted “WP” installed under canopies or other areas not subject to direct rainfall shall have aluminum self closing covers that are rated for wet location with cover closed. Devices subject to direct rainfall shall have Leviton 5977/5797-GY cover rated for wet location with cord connected to device. Provide with GFCI type receptacle.

P. FLOOR OUTLETS:

(Note: Floor outlets are not allowed for new installation. Contractor must get approval from PISD prior to rough-in. Floor outlet may allow to replace existing floor outlet at existing location only).

1. Provide Legrand Wiremold Evolution Series Floor Boxes: Minimum 6 gangs of capacity, see plan for additional gangs required. Auto-close egress doors, accepts standard size wall plates, die cast aluminum cover assemblies, finished interior. Legrand EFB Series. Above grade concrete floor boxes shall have fire classification of the floor, Legrand EFB*S-FC Series. Color to be selected by Architect. Gym Floor Box must be rated for vandalproof and extreme heavy duty.

2. All on-grade floor boxes: Provide matching conduit access holes to accommodate power/AV/data devices and cabling shown on the plans. Also, provide on-grade barrier installed prior to the concrete pour in order to provide a barrier between the soil. The on-grade barrier comes with leveling feet and anchor points.

3. All fire-rated above grade floor boxes: Provide U.L. fire classified floor boxes rated for floor structures. Provide matching fittings and accessories such as power junction boxes and low voltage cabling replacement fitting boxes and conduits to accommodate power/AV/data devices and cabling shown on the plans.

4. All floor boxes, Provide matching cast metallic Flage and cover assembly for carpet, tile or other floor material. Finishes and colors available for Architect to select: Aluminum, Brass, Black, Gray and Ivory.

5. All floor boxes: Provide matching Sub-Plates, sub-plate accessories and wiring devices to match power/AV/data devices shown on the plans.

Q. Recessed TV Box: For outlets to serve TV, Contractor shall provide recessed type metal TV Box with recessed device plate and connectors to recess the TV plug and Data plug into the wall, acceptable manufacturer shall be Hubbell, P&S and approved equal.

R. DIMMERS: Lightolier Onset Series. Select dimmer for 150% of load served, 1000 watt minimum, 2000 watt maximum. Provide ivory face plate. Provide matching three way remote preset where shown.

S. Contactors for EWH: Provide lighting contactors for water heater controlled by BAS system. See plans for additional information.

T. Contactors for Outdoor Lighting: Provide lighting contractors for outdoor lighting controlled by BAS system. See plans for additional information.

U. SPARES: Contractor shall include material and labor for six spare light switch, key switches, receptacles and GFCI receptacles and remote GFCI tester. General Contractor and electrical sub-contractor shall include in the bid proposal for installation of spare wiring devices including conduit, junction boxes and 200FT 3/4" conduits and 600FT conductors for each of six spare receptacles where directed during construction. Items not installed shall become spares and be delivered to Owner's maintenance.

V. TIME CLOCK: Provide 7-Day Electronic Astronomic Time Clock.

1. Provide Intermatic Model ET8215C Series with two (2) 20A contacts to serve exterior lighting fixtures for project with lighting controlled by Time Clock. Note: For project with lighting controlled by BAS or photo cell only, time clock is not required. See plan for additional information.

2. Provide the Intermatic Model ET8000 Series time clock(s) for all 120V, 20A plumbing hot water heater circulation pump circuit(s) as shown on the electrical floor plans, typical of all.

3. Contractor shall program time clock per Owner's schedule.

4. Provide additional set of batteries for maintenance.

5. See Drawings for additional information.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

END OF SECTION 26 27 26

SECTION 26 28 13
FUSES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 FUSES

A. GENERAL: Provide fuses for all fused switches noted on the Drawings.

B. TYPE: Fuses to 600 amps shall be low peak, dual element, time delay fuses – LPS Class RK1. Larger fuses shall Limitron KTU Class L fuses. Larger fuses shall Limitron KTU Class L fuses.

C. SPARES: Provide 10% spare fuses of each size, minimum of three per size. Install in cabinet in main mechanical room.

D. MANUFACTURERS: Bussman

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

END OF SECTION 26 28 13

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 FUSE CABINET

A. Provide and install fuse cabinet in main mechanical room of each School. Provide 10% spare fuses of each size, minimum of three per size.

2.02 FUSED AND SAFETY SWITCHES

A. GENERAL: Provide disconnect switch for each motor, motor starter, electric duct heater and other equipment required by the NEC, fusible or non-fusible as required. Where motor circuit protective device is in the same room, within 50 feet of and in sight of the equipment, no additional switch is required; if those conditions do not prevail provide switch at the equipment and as indicated on Drawings. Equipment shall be listed for use with 75□ C wiring. Disconnect switches for motors controlled by variable frequency drives shall have auxiliary “early break” contact to turn off VFD when motor is disconnected. All products shall be manufactured in the United States.

B. TYPE: Heavy duty switch sized for load served; non-fusible where used purely as disconnect device. Fused switches shall accommodate Class RK1 fuses. NEMA 1 enclosure for switches inside, NEMA 3R for switches outside unless noted to be NEMA 4X stainless steel on the Drawings. Switches located in the kitchen area in exterior locations, greenhouse, kitchen and food preparation locations, exterior kitchen supply and exhaust fans, hose down areas,neear cooling towers, and in other corrosive areas shall be NEMA 4X stainless steel. Provide combination starter disconnect switch where shown on the drawings.

C. FUSES: Fuses to 600 amps shall be low peak, dual element, time delay fuses – LPS Class RK1. Larger fuses shall Limitron KTU Class L fuses. Provide 10% spare fuses of each size, minimum of three per size. Install in cabinet in main mechanical room.

D. NAMEPLATE: Provide each device with an engraved lamacoid nameplate (5/16" high letters) showing load served. Attach with mastic and two screws.

E. MANUFACTURERS: General Electric Type TH, Siemens and Schneider Electric - Square D.

2.03 ENCLOSED CIRCUIT BREAKERS

A. GENERAL: Provide where shown on the Drawings.

B. TYPE: Circuit breaker shall be selected to meet the short circuit requirements as listed on the Drawings. Mount in NEMA 1 or NEMA 3R enclosure to match application.

C. NAMEPLATE: Provide each device with an engraved lamacoid nameplate (5/16" high letters) showing load served. Attach with mastic and two screws.

D. MANUFACTURERS: Schneider Electric - Square D.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

B. Safety and disconnect switches and/or circuit breaker enclosures shall not have knockouts where located below 9'-0" in areas accessible to the public.

C. Location: Provide safety switches within 50' and in sight of motor served. There shall be minimum 3' clearance in front of safety switch and a clear path in which to access wall mounted switches (ie.: not having to walk and/or stand on obstacles such as drain pans on floor to service).

D. 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 with approval from owner, the switch shall not inhibit removal of service panels or interfere with access areas. Safety and disconnect switches for roof top equipment shall be mounted on aluminum channel support system adjacent to equipment. Aluminum channel support system shall not be secured to roof top equipment. Roof top aluminum channel support system shall be sturdily constructed to prevent movement and not depend on conduit system to achieve this purpose. Provide mounting hardware that will allow removal of safety and disconnect switches. Do not utilize drive pin anchors or self-tapping screws through enclosure.

E. Safety and Disconnect Switches: Install disconnect switches used with motor-driven appliances, motors and controllers within sight of the controller position unless indicated otherwise.

F. Variable Frequency Drive (VFD) Warning Plaque: Yellow-White-Yellow 3-layer laminated plastic engraved plaque "WARNING" (1/2 Inch Letters). "TURN OFF VFD BEFORE OPENING THIS SWITCH FOR MAINTENANCE." (1/4 inch letters). 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.

G. Provide disconnect switch for all electric duct heaters.

END OF SECTION 26 28 16

SECTION 26 29 13
MOTOR STARTER, CONTROLLER, AND CONTACTOR INSTALLATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 – PRODUCTS

2.01 MOTOR CONTROLLERS

A. Motor Controllers installed in indoor locations shall be NEMA 1 heavy duty enclosures unless shown otherwise.

B. Motor Controllers installed at kitchen and food preparation locations, hose down areas, cooling towers, exterior locations, and in other corrosive areas shall be NEMA 4X, stainless

C. NAMEPLATES: Identify each device with an engraved lamacoid nameplate (5/16" high letters) showing load served. Attach with mastic and two screws.

2.02 LIGHTING CONTACTORS

A. GENERAL: Contactors shall have poles and rating consistent with the load being served but shall have a minimum of three poles, 30 amps (20 amps tungsten) per pole at 600 volts. The load may consist of all types of ballast and tungsten lighting, resistance and motor loads. The sports lighting contactors shall be 60 amp, three pole with 277 volt coil without transformer.

B. CONTACTS: The unit shall have 100% rated double-break, silver-cadmium-oxide power contacts, field convertible from N.O. to N.C. and vice-versa and with clearly visible N.O. and N.C. contact-status indicators.

C. CONTROL: The unit shall be electrically held installed in a NEMA 1 enclosure. Provide 120 volt coil. Provide controls transformer with input and output fusing if circuit controlled is not 120 volt. Provide HOA switch to allow manual control of lights. List circuits controlled inside enclosure.

D. ENCLOSURES: Provide NEMA 1 for standard installations and NEMA 4X for installations outdoors and wet areas including kitchen. Comply with Code requirements for other environments.

E. ACCEPTABLE MANUFACTURERS: Provide products produced by Schneider Electric - Square D.

F. Contactors for emergency lighting or power shall be normally closed.

2.03 CONTACTORS

A. Contactors for emergency lighting or power shall be normally closed.

B. Enclosure:

1. Contactors and control enclosures installed in indoor locations shall be NEMA 1/2 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, and in other corrosive areas shall be NEMA 4X, stainless steel.

3. Controls: Individual contactors operated by automatic controls shall have 30.5mm HAND-OFF AUTOMATIC switches. Contactor controls shall be mounted in the contactor enclosure cover. Contactors serving receptacle loads controlled by local switching are not to have HAND-OFF AUTOMATIC OR HAND-OFF switches.

2.04 PHASE LOSS MONITOR

A. Provide a Time Mark Model 2644 monitor for each motor one horsepower and larger. Wire into starter control circuit to de-energize motor on phase loss, phase reversal or low voltage. Do not provide for chiller or DX compressor motors. Adjust trip level to 20% below motor voltage and trip delay to mid-scale. Re-adjust set points at the Engineer's direction should frequent, nuisance tripping occurs.

B. Monitor phase loss for main electrical service through Automatic Transfer Switch. Provide monitoring relay, BAS interface modules and security alarm interface module. Provide wiring and programming to send notification to CFISD Dispatch.

2.05 MANUAL MOTOR CONTROLLERS

A. Enclosures:

1. Manual motor controllers installed in indoor locations shall be NEMA 12 heavy duty enclosures unless shown otherwise.

2. Manual motor controllers installed at kitchen and food preparation locations hose down areas, cooling towers, exterior locations, and in other corrosive areas shall be NEMA 4X, stainless steel.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer's requirements and installation details on the Drawings.

B. Provide normally closed contactors for emergency lighting and power circuits where contactors are indicated or required.

C. Provide normally closed contactors for circuits controlled by "emergency power off" switches.

D. Dedicated circuits are to be used for contactor control circuits. The same dedicated circuit may be used for more than one contactor. Do not use same circuit feeding load.

E. Contactors are to be located in same room panel is located serving load.

F. Do not use contactors as raceways for conductors serving line, load or control circuit to another contactor. Each contactor shall only contain conductors that are to be landed in that contactor. Do not install conduits from one contactor to another for the purpose of using one contactor as a raceway.

3.02 INSTALLATION OF MOTOR CONTROLLERS

A. Supports: Provide individual and combination motor controllers with galvanized angle or other suitable supports if mounting on wall or other rigid surface is impractical. Controllers shall not be supported by conduit alone. Where motor controllers are mounted on equipment served, the switch shall not inhibit removal of any service panels or interfere with any required access areas. Manual motor controllers shall be installed plumb and aligned in the plane of the wall where they are installed.

B. Disconnect Switch: For self-protected motors where one pole toggle motor control switch is allowed, the switch shall be horsepower rated and as specified for toggle switches.

C. Switches for HVAC equipment such as FPT, CVB, VAV, etc. in ceilings are to be installed adjacent to or within reach of control box. Switches are not to be installed within 36 inches in front of control box from a point at top of control box down to ceiling. Switches shown on drawings at units indicate the said required separate switch and not the integral switch on unit.

END OF SECTION 26 29 13

SECTION 26 32 13
EMERGENCY GENERATORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 – MATERIALS AND METHODS

2.01 STANDBY GENERATOR

A. General: Provide standby natural gas fired generators suitable for outdoor installation with remote mounted panel and transfer switches. See plans and one line diagrams for size and quantity.

B. Engine: Four cycle gas engine, complete with electronic governor for tight frequency control and starter.

C. Alternator: Revolving field, four pole brushless type with epoxy impregnated windings rated set for 480Y/277 volts, 3 phase, 4 wire. Size and Quantity are specified on the Drawings.

D. ACCESSORIES:

1. Weatherproof housing with residential muffler and rain cap for outside installation.

2. Provide a remote digital display to monitor load power conditions, adjusting transfer switch parameters, monitoring network status and reviewing transfer switch events. Monitor shall be password protected to limit access to adjustments and key lock protected to prevent unauthorized activation of transfer or test functions.

3. 125 watt, 120 volt heater in alternator to compensate for condensation.

4. Starter batteries.

5. Engine coolant heater, 1500 watt at 120 volts. Provide dedicated circuit.

6. Voltage sensing dry contact to verify AC power generation.

7. 3-pole AC output line circuit breaker. Size and Quantity are specified on the Drawings.

8. 10 amp, 24 volt battery charger (Model 305-0813-01). Provide dedicated circuit.

9. Complete oil and coolant charge (with anti-freeze to 0° F).

10. Gas pressure reducing valve and flexible hose with stainless steel wire braid covering for natural gas connection.

11. Cables between unit, batteries, charger, controller, remote annunciator and transfer switch.

12. Provide a remote annunciator panel to indicate system status, voltage and load conditions. Install adjacent to transfer switch. Note: Install remote annunciator next to Automatic Transfer Switch.

13. Interlock automatic transfer switch with school security alarm system to monitor power outage to notify the District Police Department when the building is on emergency power.

14. Provide all required cabling and devices for fully functional systems.

E. Testing: Provide 8-hour load test and run-in with full load at the local distributor's facility prior to shipment. After installation provide complete startup and checkout of generator and transfer switch.

F. ACCEPTABLE MANUFACTURERS: Cummins

PART 3 – EXECUTION

3.01 INSTALLATION

A. Provide 6” thick concrete pad for each unit. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 6" all around. Reinforce pads rebar including #4 bar around perimeter. Tool pad to form chamfered edge.

B. Vibration isolation: provide ribbed neoprene vibration isolation.

C. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

D. Locate remote annunciator adjacent to automatic transfer switch.

E. Furnish the exact position of any block outs, mounting bolts, and the dimensions and location of the generator pad in a timely manner so as to prevent delay of the concrete work. Refer to Section 26 00 00 for housekeeping pads and Division 3 for Concrete Work.

F. Provide documented report of generator rotation matching service.

3.02 FINAL APPROVAL

A. The final approval test of the generator system shall consist of opening the building main circuit breaker. Generator shall start and automatically power the electrically load connected to the associated electrical panels. All emergency lights shall illuminate. After operation of emergency loads are verified, main circuit breaker will be closed. Generator system shall wait the prescribed time then automatically transfer these loads back to the utility service. All lights that were ON prior to opening main circuit breaker shall come back ON automatically. Generator shall wait the prescribed time then shut off. Test shall be performed by the factory authorized representative and witness by project A/E team and school personnel.

3.03 WARRANTY

A. Provide 5 year or 1500-hour operation, non-prorated, parts and labor warranty for the generator.

3.04 SERVICE CONTRACT

A. Provide 1-year service contract that includes monthly visits to observe and record condition, and verify generator “exercise” programming is operational. Generator exercise schedule shall be coordinated with CFISD for day and time. Initially set for Tuesdays at 8 AM without load transfer.

3.05 TRAINING

A. Provide four hours training on operation and maintenance of the generator and transfer switch for four persons at the school site.

3.06 GROUNDING

A. Install the generator as a separately derived system. Ground the generator neutral to the generator frame. Ground the generator frame to the building grounding system and provide a driven ground electrode at the generator location.

END OF SECTION 26 32 13

SECTION 26 36 23
AUTOMATIC TRANSFER SWITCHES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 – MATERIALS AND METHODS

2.01 AUTOMATIC TRANSFER SWITCHES

A. General: Provide transfer switches installed in NEMA 3R cabinets. Refer to drawings for sizes and quantity are required.

1. Note: Install generator remote annunciator next to Automatic Transfer Switch.

B. Ratings: 480 volts, 3 phase. Provide three pole switch with neutral bar. Provide switching sequence compatible with Houston Lighting and Power Company requirements. Unit shall have a long-time/closing rating of 14,000 AIC independent of the system circuit breaker or 22,000 AIC if the switch has been tested with the specific circuit breaker installed upstream of the utility contacts.

C. Accessories:

1. Extended start time delay (0 to 90 seconds).

2. Seven-day exerciser clock.

3. Programmed transition (0 to 60 seconds).

4. 24-volt coil auxiliary relay with 2-NO and 2-NC dry contacts.

5. Voltage, Amp and Frequency meters with phase selector switch.

6. Interlock Automatic Transfer Switches control system with school security alarm system to monitor power outage to notify the District Police Department when the building is on emergency power.

7. Provide all required cabling and devices for fully functional systems.

D. Drawings: Provide five sets of service/operation manuals and one set of drawings for the standby generator and transfer switch system and equipment.

E. Warranty: Provide 5 year, non-prorated, parts and labor warranty for the transfer switch system.

F. ACCEPTABLE MANUFACTURERS: Onan/Cummins, Kohler, ASCO, GE Zenith, Caterpillar and Power Generation.

G. PROGRAMMING:

1. Program weekly test with no load Tuesday morning at 8am.

2. Program test button START and transfer switch with load.

H. 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 Wall Mounted Lighting GTD Example

ATS-1	**GTD**
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

PART 3 – SETUP AND TESTING

3.01 SYSTEM SETUP

A. The main emergency transfer switch (ATS-M) serving the required lighting and other emergency loads shall be set to start the generator and then transfer the load to the generator with a 1-2 second time delay. The secondary transfer switch (ATS-K) serving kitchen and other optional loads shall be set to transfer to the generator approximately five seconds after ATS-M. Once utility power is restored, the ATS-K shall switch loads back to the utility after five minutes. ATS-M shall switch loads back to the utility after an additional five minutes.

B. Should generator over current conditions be sensed, ATS-K shall be transferred back to normal power to ensure ATS-M loads are met.

C. Settings shall be modified as required during testing to ensure that required emergency loads are properly served and lighting transfers are coordinated with the lighting control panels, without interference by the non-emergency load transfer switch ATS-K.

3.02 FINAL APPROVAL

A. The final approval test of the generator system shall consist of opening the building main circuit breaker. Generator shall start and automatically power the electrically load connected to the associated electrical panels. All emergency lights shall illuminate. After operation of emergency loads are verified, main circuit breaker will be closed. Generator system shall wait the prescribed time then automatically transfer these loads back to the utility service. All lights that were ON prior to opening main circuit breaker shall come back ON automatically. Generator shall wait the prescribed time then shut off. Test shall be performed by the factory authorized representative and witness by LTY and school personnel.

END OF SECTION 26 36 23

SECTION 26 41 13
LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

PART 2 - SYSTEMS

2.01 GENERAL

A. Furnish and install a complete system of lightning protection as described in these Specifications and the Drawings. The system shall be in compliance with the provisions of the Lightning Protection Institute Installation Code LPI-175, the NFPA Code 78 and Master Label provisions of the U. L. Code 96A. The system shall be installed under the direct supervision of a certified master installer of the Lightning Protection Institute (LPI).

2.02 MATERIALS

A. All materials for this system shall be manufactured by a certified member of the LPI. System materials in general shall be copper and high copper content bronze castings, and shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems. Materials shall comply in weight, size and composition for a Class I structure. The system shall consist of all necessary cables, air terminals, mounting bases, fittings, couplings, connectors, fasteners, etc. as required to give a complete and coordinated system. All cable and all air terminals used shall bear the U. L. label.

B. All fittings except cable holders shall be heavy duty type made from lead coated, bronze castings. Pressure plates made from stamped or pressed metal parts, or fittings utilizing crimp type pressure devices are not acceptable. All bolts, screws and related types of hardware shall be stainless steel.

C. All cable conductors shall be minimum 2/0 copper cable, tin plated, comprised of a minimum of 15 gauge wire strands, weighing not less than 380 pounds per 1000 feet.

D. Air terminals shall be of 1/2 inch diameter, chrome plated, solid copper rod.

2.03 INSTALLATION

A. Install top of terminal a minimum of 10 inches above the object to be protected. Place air terminals at or within 2 feet of corners or edges of main roofs, at intervals of 20 feet or less along edges of flat roofs and at 50 foot intervals on cross runs. All air terminals shall have a two way ground path.

B. Bonding of all metallic objects and systems at roof levels and elsewhere on the structure shall be complete. Primary bonds for metal bodies of conductance shall be bonded with appropriate

fittings and proper size conductor. Bond all roof fans, air intakes, antenna masts and mechanical equipment.

C. Metal bodies of inductance located within six feet of a conductor or object with primary bond shall be bonded with secondary cable and fittings. Included are: roof flashing, parapet coping caps, gravel guards, isolated metal building panels or siding, roof drains, down spouts and roof ventilators.

D. System conductors shall be concealed wherever practical. All main downleads and roof risers shall be concealed within the building walls or columns. Install one inch PVC conduit with upper ends terminating above the top floor accessible ceiling. Make roof cable penetrations with approved through roof connectors and copper pitch pans. Conduit terminations at ground level shall be approximately six inches above finished ground level.

E. System ground shall consist of 3/4" diameter by 10 foot copper clad rods driven into earth with at least two feet of cover.

F. Provide common ground connection between the lightning protection system and electric, telephone and antenna system grounds and to all underground piping to building.

2.04 CERTIFICATION

A. Prior to final inspection, installation of the system shall be certified as correct in accordance with these specifications and applicable codes. Master installer shall certify on Form LPI-175A, covering jobsite witness of grounding connections. At completion of project he shall certify on Form LPI-175B, covering post installation inspection that the system is complete as specified. Contractor shall also furnish Owner with U. L. Master Label C certificate.

END OF SECTION 26 41 13

SECTION 26 43 13
TRANSIENT VOLTAGE SUPPRESSION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

A. GENERAL: Provide TVSS equipment for electrical panels and equipment as noted on the Drawings. TVSS shall be installed in NEMA 1 housing and mounted adjacent to the equipment to be protected. Connect TVSS to three pole circuit breakers in the panel with wiring as short and straight as possible. Where noted on the riser provide TVSS integral to panel or switchboard.

B. DISPLAY: Provide digital transient counter with battery backup.

C. SUPPRESSION MODES: System shall provide suppression of L-L, L-N, L-G and N-G transients.

D. RESPONSE TIME: 1 nanosecond or less.

E. EMI/RFI ATTENUATION: 38 dB or better.

F. WARRANTY: 10-year, non-prorated replacement.

G. TVSS RATING:

1. 160 kAmps per phase

2. 240 kAmps per phase

H. ACCEPTABLE MANUFACTURERS

1. Low exposure, minimum 10-year parts warranty, minimum 50k Amps per mode, 100k Amps per phase, Type 1 and Type 2.

a. Recessed mount panelboard extension with brushed stainless-steel front:

1) ACT Communications:471- ###V-050-SS-F-PB flush series.

2) ABB Current Technology PX3-050-VVV- #X-SF-X-F- # series.

b. Branch panelboard surface mounted:

1) ACT Communications 455 series.

2) ABB Current Technology CGC50 series.

2. Medium exposure, minimum 15-year parts warranty, minimum 120k Amps per mode, 240k Amps per phase, Type 2.

a. ACT Communications 471 series

b. ABB Current Technology CGP120 serie

3. High exposure, minimum 20-year parts warranty, minimum 200k Amps per mode, 400k Amps per phase, Type 2 SPD.

a. ACT Communications 471 x200 series.

b. ABB Current Technology TG 200 series.

4. Very high exposure at service entrance 1,201 Amps and above: Minimum 20-year parts warranty; minimum 200k Amps per mode; 400k Amps per phase, Type 2 SPD:

a. ACT Communications 471 SEL series.

b. ABB Current Technology SEL3 200 series.

2.02 SPECIAL EQUIPMENT TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

A. GENERAL: For certain 120-volt circuits provide TVSS protection at the protected device.

B. INSTALLATION: Install device in junction box surface mounted in mechanical rooms or above accessible ceiling if equipment is not in mechanical room. The branch circuit shall terminate on the TVSS then subfeed the equipment. The wire between the device and the equipment shall be three to five feet long.

C. TVSS: Ditek Model DTK-120SR surge suppressor

D. EQUIPMENT PROTECTED: Install for fire alarm panel, security panel and CCTV panel.

2.03 TELEPHONE LINE TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

A. GENERAL: Install for telephone connections to fire alarm and security alarm dialers.

B. TVSS: Ditek Model DTK-MRJ31XSCP-WP

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

B. 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 manufacturers recommended installation instructions. Connection shall not be any longer than necessary, avoiding unnecessary bends. Minimum wire size and overcurrent protection shall be provided and as indicated or recommended by the manufacturer.

C. Units specified for lighting and appliance panel boards as panelboard extensions (EGPE) shall be mounted directly below and flush with 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.

D. Units specified power distribution panelboards, switchboards, or motor control centers shall be mounted adjacent to the power distribution panelboard or switchboard 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.

E. Overcurrent device used as a local disconnect 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.

F. Surge Protection Devices shall not be installed above panelboards, locate on sides adjacent to the circuit breaker serving the SPD or on the bottom of the panelboard.

END OF SECTION 26 43 13

SECTION 26 51 13
INTERIOR LIGHTING FIXTURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 LIGHT FIXTURES

A. GENERAL: Provide all fixtures as shown, completely wired and securely attached to supports. Include all necessary accessories including heavy duty, chrome plated wire guards on high bay and indirect fixtures, and over exit lights located in the gymnasium. Fixture models scheduled are to show general type of fixtures required. Furnish mounting design and trim to fit type of ceiling and finish on which fixture is to be installed. Fixture shall be designed to operate satisfactorily where installed including the required fire proofing. All fixtures are static unless noted to be otherwise on the fixture schedule. All lens and doors shall securely attached to the housing with spring operated latches to prevent release due to vibration or gravity.

B. PAINT: All fluorescent fixture housings shall have a complete coverage of white alkyd reflecting enamel, 85% minimum reflectivity, applied after fabrication then baked in a temperature controlled oven until paint is thoroughly cured. Prior to applying the enamel, each metallic surface shall be prepared for painting by using a five stage hot zinc phosphatizing process. Baked polyester powder finish is acceptable.

C. PLASTIC REFRACTORS/DIFFUSERS: Material shall be light-stable 100% virgin acrylic, translucent (98% minimum transmission), conforming to minimum standards of IES-NEMA-SPI. Material shall perform as applied in a normal interior environment for a period of 20 years, without noticeable deformation and with a transmission loss not exceeding 5%. Nominal thickness of material shall be .125" for either extrusions or injections.

D. LED LIGHT FIXTURES: All LED light fixtures and lighting drivers shall be DLC or Energy Star Listed. Provide minimum 5 year warranty.

E. LED LIGHT FIXTURE DRIVERS: Maximum of 10% THD, a minimum ballast factor of 0.90, a minimum power factor of .99. LED light fixture Drivers installed in fixtures mounted in U. L. fire rated ceilings or ceilings with insulation on top shall be of low heat type to allow operation under these conditions. Drivers shall be warranted for five years from date of substantial completion of the project. Drivers shall be manufactured by Advance, Motorola, Magnetek or Approved Equal.

F. FIRE PROTECTION: Provide fixture fire protection as required by U. L. Fire Resistive Index for the type ceiling to be installed. Provide additional fireproofing as required by the local building code. Protection is specified under the Ceiling Section of these Specifications.

G. SUPPORT: Adequate, sturdy support as necessary to prevent possibility of fixture falling. Layin fixtures shall be supported with wire hangers at all four corners. Surface and pendant fluorescent fixtures must be supported with two supports per four foot section. All pendants must have swivel aligners located at the top ends; pendants shall be 1/2" rigid steel conduit, unless specifically indicated otherwise on drawings, painted as directed by Architect on jobsite. Support surface mounted fluorescent fixtures from structural members other than ceiling tees by providing Unistrut members laid across main ceiling tees or by attachment directly to structure. Provide caddy clips for recessed fixtures. Pendants for indirect light fixtures shall be securely attached to structure or Unistruts across joists using threaded connections. High bay fixtures and light fixtures installed higher than 14’ shall have manufacturer supplied quick disconnect mounting hardware and safety cable.

H. Generator transfer switch device (GTD) to be installed above ceiling shall be 20A rated and supplied with Digital Lighting Control System. GTD shall not be installed inside the light fixtures. Provide GTD for each indoor and outdoor emergency lighting circuit on separate switch, contactor or relay. See Digital Lighting Control System Specifications for additional information. Note: For dimmable light fixture, ensure GDT is designed and rated for dimmable light fixture application. Mount GTD above 18” above ceiling at entry / light switch wall.

I. INTERIOR PHOTOMETRIC: Lumens output shown on the light fixture schedule is only the minimum lumens output. Contractor shall submit floor plans with all interior light fixtures. Contractor shall provide photometric calculations and increase light fixture lumens level as required to meet the light level table below.

Light Level Table:

Room Type	Average maintained light level in foot candles at work surface
Classrooms	50 FC Minimum
Any Instructional Space	50 FC Minimum
Office and Workrooms	50 FC Minimum
Computer Labs	50 FC Minimum
Kitchen	50 FC Minimum
Gym	75 FC Minimum
Science Labs	60 FC Minimum
Auditorium and Stage	50 FC Minimum
Student Dining / Commons	50 FC Minimum
Mechanical Rooms	50 FC Minimum
Corridors	30 FC Minimum
Restrooms	30 FC Minimum
Lockers / Storage	30 FC Minimum

J. EXTERIOR PHOTOMETRIC: Submit site plan with all exterior light fixtures mounted on the building, at the parking lets and other exterior area. Provide photometric calculations and adjust light fixture distribution optic and lumens output as required. Lighting level at the project property lines must comply with latest version of LEED green building requirement for school building in order to prevent lighting pollution outside the school property lines. Contractor shall provide photometric floor plan layout in AutoCad Drawings during submittal and construction period to

determine optimal mounted height of light fixtures. Provide average 3-5 maintained light level with max to min ration of 10 to 1.

K. ATTIC STOCK:

1. Attic stiock for light fixtures and LED drivers: Attic stock shall be boxed in **OEM** sealed packagign and boxes and clearly labeled for contents. Large quantities of the same item boxes may be palletizied and shrink wrapped, and clearly labeled on the outside of the skrink wrap, stored as directed by PISD.

2. Exterior light fixtures and parking lot pole mounted light fixtures: For each light fixture type, furnish two percent, a minimum of two to a maximum of 550 complete light fixture assemblies and also the same quantity of individual componet LED drivers and LED chip arrays.

3. Interior light fixtures: For each light fixture type, furnish two percent, a minimim of two to a maximum 50 of complete light fixture assemblies and also the same quantity of individual component LED drives.

4. Exit light fixtures: For each exit light fixture type, furnish a minimum of two and a maximum of 10-percent of complete light fixture assemblies and also the same quantity of individual component LED drivers. Provide complete installation of intended attic stock exit signs as directed by the AHJ for certificate of occupancy or otherwise directed by the Architect/Engineer. Attic stock exit signs not required to be installed shall remain the property of PISD as boxed attic stock.

L. WARRANTY: Provide 5-year warranty on all light fixtures, including internal or remote LED drivers, all other electrical internal electrical or electronic components. Refer to other specific component warranty requirements below.

M. ACCEPTABLE MANUFACTURERS: Provide two separate pricings from two manufactures listed below. Owner will review the pricing and select one of the following;

1. Manufacturer A: PSA Lighting (Basis of Design).

2. Alternate Manufacturer B: CW Lighting.

2.02 LED LIGHT FIXTURES

A. Fixtures 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. Driver and LEDs shall be accessible from the bottom of the light fixture from below the ceiling.

b. Safety chains for fixtures in mechanical and electrical rooms. Provide light fixtures suitable for high abuse areas that do not require wire guards. 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 or stainless-steel 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.

h. Color Rendering Index (CRI): ≥ 80 Indoor; ≥ 65 Outdoor.

2. LED Exit Signs: Provide red lettering. The exit lighting fixtures shall meet the requirements of Federal, State, and Local Codes.

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 or similar.

3. Emergency Lighting Units: Lead Calcium batteries with self-diagnostics. Provide full light output at 90 minutes of battery operation.LED lamps.

4. 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. Do not use light fixtures that require wire guards in a gymnasium or high abuse type environments.

2.03 LED DRIVERS:

A. NEMA 410 compliant for in-rush current.

B. Starting Temperature: -40˚ F [-40˚ C].

C. Input Voltage: 120 to 480 (±10%) V.

D. Power Supplies: Class I or II output.

E. 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.

F. Power Factor (PF): ≥ 0.90.

G. Comply with FCC Title 47 CFR Part 18 Non-consumer RFI/EMI Standards.

H. Drivers shall be reduction of hazardous substances (ROHS)-compliant.

I. 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.

J. 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.

K. Emergency Battery Packs – Exit Signs: Nickel Cadmium battery with self-diagnostics; Minimum 3-year non-prorated replacement warranty.

L. 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 remote test switch.

M. Emergency Generator / Inverter branch circuit transfer switch:

1. UL 1008.

2. 20 Amp ballast/driver load.

3. 0-10Vdc dimming compatible.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

B. Fixtures shall fit the type of ceiling system scheduled.

C. Provide four separate wire supports for recessed ceiling mounted lighting fixtures, one at each corner of fixture. 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. 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.

I. Provide luminaires to permit removal and replacement parts from below ceiling through the bottom of fixture.

J. 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.

K. 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.

L. 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.

M. Provide emergency battery operated light fixtures at all transfer switch locations and at all central battery emergency lighting inverters.

N. 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

O. Lighting contactors shall not be installed above ceiling and shall be readily accessible, located in same room as panelboard and adjacent to panelboard serving load.

P. 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.made in the top of the fixture. Conduit penetration shall be at the end of the fixture only.

Q. 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

R. Final aiming and Adjustment: Aim and adjust aimable and adjustable lighting fixtures for their intended purpose. Re-aim and re-adjust as required to the satisfaction of the Owner, including nighttime adjustment of exterior lighting in the presence of the Architect / Owner.

3.02 LIGHTNG POLE INSTALLATION

A. To protect finish, use fabric web slings (not chain or cable) to raise and set finished poles and standards.

B. 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 #2 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.

C. Wiring:

1. Provide Type SO cord from base of pole lights to top of poles for lights and receptacles. Do not use single conductors.

2. Install inline fuse holders, fuse holder insulating boots, fuses, at base of pole lights on each lighting circuit. In-line fuse holder shall be Bussman, Tron In-Line Fuse Holder, HEG Series with insulating boot cat # 2A0660. 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 wire nuts or mechanical lugs for all site lighting conductors.

4. Provide conductor stress relief at top of pole for the SO cord. The weight of the SO cord is not to be supported by connections to light fixture or receptacle for camera.

5. Inline fuse holders, and fuses are required for LED light fixtures installed on poles.

PART 4 - TESTING

4.01 TESTING DEMONSTRATIONS

A. Final aiming and Adjustment: Aim and adjust aimable and adjustable lighting fixtures for their intended purpose, as specified, as indicated and/or recommended by Manufacturer's photometric report. 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. Provide five business day notification of proposed night-time review by Owner / Architect.

END OF SECTION 26 51 13

SECTION 26 56 00
EXTERIOR LIGHTING FIXTURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SUBMITTALS

A. Provide submittals as outlined in Section 26 00 00 General Electrical

PART 2 – PRODUCTS

2.01 LIGHT FIXTURES

A. GENERAL: Provide all fixtures as shown, completely wired and include all necessary accessories.

B. LAMPS: All pole mounted lights shall be LED type.

C. LIGHT POLES: All poles shall be selected to support the scheduled fixtures and equipment for 130 MPH wind loading plus 1.3 gust factor. All poles shall be tapered aluminum poles. Provide a reinforced concrete support base 24" in diameter by 60" in ground with 30" above grade. Contractor must submit photometric calculation on a site plan to with appropriate lighting level for school application.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall comply with manufacturer’s requirements and installation details on the Drawings.

END OF SECTION 26 56 00

SECTION 27 00 00

GENERAL TECHNOLOGY REQUIREMENTS

PART 1 – GENERAL

1.01 PROJECT SUMMARY

A. Scope: Contractor shall provide, install, configure, and provide warranty service for technology systems described herein.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Section, apply to this Section.

1.03 RELATED WORK

A. Section 27 05 00 – Communications General Requirements

B. Section 27 05 23 – Pathways for Technology Systems

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 11 00 – Communications Equipment Rooms

E. Section 27 13 00 – Communications Backbone Cabling

F. Section 27 15 00 – Communications Horizontal Cabling

G. Section 27 16 00 – Communications Connecting Cords

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 40 00 – AV/Multimedia General Requirements

J. Section 27 41 00 – Audio Visual Systems

K. Section 27 51 00 – Distributed Communications Systems

L. Section 27 60 00 – Physical Security General Requirements

M. Section 27 64 00 – Video Surveillance System

N. Section 27 66 00 – Intrusion Detection System

O. Section 28 13 16 – Access Control System

1.04 ALLOWANCES

A. Contractor shall maintain project allowances for technology systems that will be procured by separate contract. The purpose is to allow technology to evaluate and make best practices decisions. Allowance are to be held and allocated at the owner's direction. Contractor shall reference Division 01 Allowances. The Allowances are defined as:

B. Campus Network Services and Telephones:

1. Core route/switching (District Standard Juniper QFX Series)

2. Edge switching (District Standard Juniper EX Series Full PoE)
3. Wireless Access Points (District Standard is Cisco WAP)
4. Classroom, Office and Admin Telephones (District Standard is Cisco/IPCelerate)
5. Relocation/ Addition of Service Provider Fiber (Provider is Phonoscope)
6. Move Day Support Services (Relocation of all technology related devices)

C. Campus Security Devices:

1. Access Control System with Locks and Card Readers (District Standard is Genetec Security Center w/ Hanwha Cameras)
2. Video Surveillance Manager and Cameras (District Standard is Genetec Omnicast w/ Hanwha Cameras)

D. Campus AV Multimedia Devices:

1. Digital Signage Systems (District Standard is LG w/ Wallboard with 5 year license)
2. Menu Board Signage Systems (District Standard is Meal Viewer)
3. Conference Room Interactive Flat Panel Displays (District Standard is TBD)
4. Classroom Interactive Projectors and Speakers (District Standard is Epson)
5. Large Venue Projectors (District Standard is Epson-L Series)
6. Classroom Interactive Panels (District Standard Promethean)

1.05 DEFINITIONS

A. Approved or Approval: Where approval is called for, only persons with the authorized authority may grant approval. Owner reserves all rights to govern over and grant approval and will appoint authority of agents acting on their behalf.

B. As Required: Contractor shall provide the quantity of said item that is necessary. Owner and Consultant reserve the right to make the final determination of necessary quantities to provide for a complete system.

C. Basis of Design: The documentation of the concepts, calculations, decisions, and product selections used to meet the Owner's project requirements. These Consultant produced documents are not shop drawings. Product selections depict minimum functionality and overall quality and are open to substitution requests.

D. ETR: Existing to Remain. Item is to remain in current location and maintain current functionality.

E. Furnish: To supply and deliver to project site, ready for installation.

F. Install: To place in a position of service or use.

G. Provide: To furnish and install, complete and ready for intended use.

H. NIC: Not in Contract. Item will be the responsibility of others.

I. OFCI: Owner Furnished Contractor Installed. Item will be provided by Owner and shall be installed by Contractor.

J. OFE: Owner Furnished Equipment. Item will be provided and integrated by Owner.

K. OFOI: Owner Furnished Owner Installed. Item will be provided and installed by Owner.

1.06 REFERENCE STANDARDS AND CODES

A. Standards and other procedures referenced by this bid package are as follows:

1. ADA – Americans with Disabilities Act of 2010
   www.ada.gov/2010ADAstandards_index.htm
2. AIA – American Institute of Architects
   www.aia.org
3. ANSI – American National Standards Institute
   www.ansi.org
4. ASTM – American Society of Testing and Materials
   www.astm.org
5. BICSI – Building Industry Consulting Service International, Inc.
   (RCDD Standards)
   www.bicsi.org
6. CFR – Code of Federal Regulations
   www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR
   (Available from the Government Printing Office)
   (Material is usually first published in the Federal Register)
7. U.S. Copyright Law, December 2011
   www.copyright.gov/title17
8. ECIA – Electronic Components Industry Association
   ESC – EIA Standards Council
   www.eciaonline.org
9. IACS – International Annealed Copper Standard
   www.ndt-ed.org/GeneralResources/IACS/IACS.htm
10. IEC – International Electrotechnical Commission
    www.iec.ch
11. IEEE – Institute of Electrical and Electronics Engineers
    standards.ieee.org
12. ISO – International Organization for Standardization
    www.iso.org
13. ITU-T – International Telecommunication Union – Telecommunication
    www.itu.int
14. NEC – National Electrical Code (NFPA 70)
    maintained by NFPA – National Fire Protection Association
    www.nfpa.org
15. NECA – National Electrical Contractors Association
    www.necanet.org
16. NEMA – National Electrical Manufactures' Association
    www.nema.org

17. OSHA – Occupational Safety and Health Administration
    (U.S. Department of Labor, OSHA)
    www.osha.gov

18. TIA – Telecommunications Industry Association
    www.tiaonline.org/standards

19. UL – Underwriters' Laboratories
    www.ul.com

B. Standards: Referenced standards and/or procedures shall be binding on the Contractor and work shall be judged against such standards and procedures unless otherwise stated in writing.

C. Local/State Codes: Contractor shall comply with all local and state code requirements as determined by the authority having jurisdiction (AHJ).

D. Owner Standards: Contractor shall obtain and abide by all published Owner standards as they pertain to the work described herein.

E. Contractor shall use the latest versions of all standards and codes unless otherwise directed by the authority having jurisdiction (AHJ) or expressly noted herein.

1.07 QUALIFICATIONS

A. Refer to related sections for specific requirements.

1.08 PERMITS AND INSPECTIONS

A. Responsibility: Obtain permits and inspections required for the work. Contractor is responsible for all permit and inspection costs.

B. Performance: Perform tests required herein, or as may be reasonably required to demonstrate conformance with the specifications or with the requirements of any legal authority having jurisdiction.

C. Review: Obtain approvals from authorities responsible for enforcement of applicable codes and regulations to establish that the work follows all requirements of reference codes indicated herein and required by the appropriate jurisdiction. Make corrections, changes or additions as required and deliver certificates of acceptance, operation, and/or compliance with the Operation and Maintenance Manuals described herein.

1.09 DRAWINGS AND BASIS OF DESIGN

A. General: Work, equipment, or material delineated on any drawing in this package is expected to be provided by Contractor unless noted otherwise.

B. Interpretation: Work shall be installed in accordance with the basis of design diagrammatically expressed on the drawings and described in the written specifications and equipment schedule(s). Contractor shall not make limiting interpretation that provides for incomplete work or a non-functioning system.

1.10 PRE- CONSTRUCTION PROCEDURES

A. Prior to Work: Submittals shall be provided to Consultant with appropriate promptness as to cause no delay to the work.

B. Project Timeline: Project timeline will not be altered due to lateness of submittals. Contractor is bound to deliver a timely, complete, and finished project as stipulated in their contract and specified herein.

C. Format and Distribution: Contractor shall provide one (1) electronic copy in PDF format of all submittals. The Contractor shall provide hard copies sets as required up to five (5) sets.

D. Provision: Contractor shall submit submittals, including any corrections or additions to Consultant prior to the procurement of equipment or commencement of work.

1.11 SUBMITTALS

A. Submittals are intended to document the details of installation. Exact copies of original drawings and specifications are not acceptable as submittal drawings. Consultant schematic diagrams describe the basis of design as defined herein.

B. Contractor shall provide the following, in a single submission, as submittals for approval; in addition to specific requirements identified in subsequent sections.

1. Qualifications: Shall include documentation of all required qualifications.

2. Shop Drawings:

a. Title: Each drawing shall have a descriptive title and all subparts of each drawing shall have unique identifiers.

b. Floor Plans: Shall include device locations, anticipated cable routing. Contractor provided furniture and installation notes.

c. System Drawings: Shall include functional diagrams for each system detailing system flow including all equipment, routing, inputs/outputs, wiring signal type, cable identification detail, connectors, adapters, intra/inter-rack power distribution, installation notes and any other information required to convey the complete turnkey system design.

d. Equipment Rack and Cabinet Elevations: Shall include placement of all mounted equipment.

e. Structurally Mounted Elements: Shall include both plan view of placement as well as a detail of structural mounting techniques to be used.

f. Furniture: Shall include all Contractor provided furniture showing dimensional drawings, cable management and finishes with samples for Owner approval.

3. Product Data:

a. Equipment Schedules: Shall include manufacturers, part numbers, quantities, and unit pricing.

b. Product Cut Sheets: Shall identify (highlight, arrow, etc.) actual part numbers to be utilized including but not limited to equipment, mounting hardware, cabling, connectors, software and power distribution equipment.

c. Do not provide owner’s manuals as cut sheets.

4. Manufacturer’s Recommendations:

a. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, copies of these recommendations shall be provided prior to installation. Installation of the

items will not be allowed to proceed until the recommendations are received and approved.

1.12 PRE- INSTALLATION PROCEDURES

A. Refer to individual sections for additional information.

1.13 Construction Progress Procedures

A. Coordination: Contractor shall request additional job construction coordination meetings it deems to be necessary to ensure coordination of their responsibilities with other parties.

B. Progress Inspection: Consultant may perform periodic progress inspections. Contractor shall make Project Manager and/or Lead Technician available.

C. Test Plan: Ten (10) business days prior to the proposed Contractor test date, Contractor shall provide a test plan defining the tests required.

1. The test plan shall be approved by Consultant prior to any testing.

1.14 CONSTRUCTION PROGRESS SUBMITTALS

A. Completion: Contractor shall complete and submit via email all construction progress documentation in PDF format as requested by Owner and Consultant.

B. Contractor shall provide to Consultant the following construction progress submittals in addition to specific requirements identified in subsequent sections.

1. Weekly Report: Weekly written report to be submitted to Consultant through appropriate project channels in PDF format outlining progress from previous week, plans for progress in the current week, and any coordination issues that may require Consultant or Owner attention.

2. Test Plan: Shall ensure the system meets Owner operational and performance specifications and include the following:

a. Identification of the capabilities and functions to be tested.

b. Detailed instructions for the setup and execution of each test.

c. Procedures for evaluation and documentation of the results.

1.15 CLOSEOUT PROCEDURES

A. Notification: Contractor shall provide written notification to Consultant and Owner when Contractor is satisfied that the work has reached Substantial Completion and is ready for inspection.

B. Pre-Inspection Submittals: Contractor shall submit an electronic copy of all closeout submittals to Consultant in accordance with the requirements found in these documents no less than ten (10) business days prior to the scheduled Final Inspection.

1. Test Results

2. Record drawings (full-size sheets)

3. Operation and Maintenance Manuals

4. End User Software

5. Photos that demonstrate complete system installation.

C. Punch List: Work or materials found to be incomplete, of unsatisfactory quality, failing to meet the specifications in these documents, and/or unacceptable to Consultant or Owner shall be documented by Consultant and provided to Contractor to rectify at no additional cost. Contractor shall provide written notification when all punch list items have been completed.

D. Final Inspection: At Consultant's request, Contractor shall make Project Manager and/or Lead Technician available.

E. Re-Inspection: If more than one (1) re-inspection is necessary, the costs of the additional travel, time, and expenses of Owner and Consultant may be deducted by Owner from the contract amount due to the Contractor.

F. Punch List Approval: Once all punch list items are complete, the Contractor shall return an initialed punch list to the Consultant and Owner for verification. Punch list shall be considered complete only after having been signed by Owner and Consultant.

G. Closeout Submittals: Upon approval of closeout submittals and prior to final acceptance, Contractor shall provide three (3) electronic copies to Owner and Consultant in format(s) noted below.

1. Record Drawings – AutoCAD 2013 editable .dwg format AND PDF.
2. Operation and Maintenance Manuals – USB Thumb Drive.
3. End User Software – USB Thumb Drive.
4. Documentation of testing and system certification.

H. At each Telecom Room, provide full -sized laminated Technology Record Drawing. Include Data and PA symbol locations.

I. Closeout Submittal Format and Distribution: Upon approval of closeout submittals and prior to final acceptance, Contractor shall provide one (1) digital copy with labeled dividers of all record drawings (full-size sheets) and operation and maintenance manuals, one (1) digital copy to Owner and Consultant. Title on front and spine of binder shall be "Operation and Maintenance Manual – [Project Name]". The following additional items shall be identified on the binder cover:

1. Client Name
2. Contractor Name and Contact Information
3. Consultant Name and Contact Information
4. Date

1.16 CLOSEOUT SUBMITTALS

A. Closeout submittals are intended to document the details of the final installation that substantially conforms to the construction documents and functions as intended to meet the Owner's needs.

B. Contractor shall provide to Consultant the following closeout submittals for approval in addition to specific requirements identified in subsequent sections.

1. Record drawings of prints prepared by the Contractor. Reference Division 01 section for "Project Record Documents"
2. Record drawings: Reference Division 01 section for "Project Record Documents."

3. Operation and Maintenance Manuals: Reference Division 01 section for “Project Record Documents”
    a. A final Bill of Materials for each system.
    b. A Microsoft Excel (.xlsx format) spreadsheet for each device that resides on the network, provide the following:
        i. IP Address
        ii. MAC Address
        iii. Serial Number
        iv. Manufacturer
        v. Model Number
        vi. Device Username
        vii. Device Password
        viii. Telecom Closet or Rack Location
        ix. Patch Panel Port Number
        x. Switch Port Number
        xi. Any other relevant information as requested by Owner
    c. Manufacturers Instruction Manuals: Specification sheets, operation manuals and service sheets published by the manufacturers of the components, devices and equipment provided.
    d. Information for testing, repair, troubleshooting, assembly, disassembly, and recommended maintenance intervals.
    e. Replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.
    f. Performance, Test, and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.
    g. Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturers’ Warranty Registration papers as described herein.
    h. Sufficient information, (detailed schematics of subsystems, assemblies, and subassemblies to component level) clearly presented, shall be included to determine compliance with drawings and specifications.
    i. Any other items defined herein.
4. Local Reference Diagrams: Within each equipment rack, enclosure, or cabinet, the Contractor shall place a functional diagram of the system(s) in a clear plastic sleeve secured to the equipment rack, cabinet, or enclosure.
5. Intellectual Property: Provide all required items and written release as described herein.
6. Training Program: Proposed training materials and program outline.
7. Spare Parts and Remote Controls: Contractor shall submit record of Owner sign-off of turnover of spare parts and remote controls.

1.17 EXAMINATION OF EXISTING CONDIDTIONS

A. Examination: Contractor shall examine the facility and construction documents to the extent necessary to plan for efficient installation strategies prior to the delivery of materials to the site or the commencement of work. Other documents (Architectural Drawings, hardware schedules, etc.) may be made available upon request. Failure to adequately complete the examination shall not result in change order requests.

B. Acceptance of Conditions: Commencement of work by Contractor shall indicate acceptance of existing conditions, unless a written notice of exceptions has been provided to Owner prior to commencement.

C. Observation: If Contractor observes—during preliminary examinations or subsequent work—existing violations of fire stopping, electrical wiring, grounding, or other safety- or code-related issues, Contractor shall correct deficiencies prior to the commencing work of this section.

D. Damage during Installation: Repairs shall match preexisting color and finish of walls, floors, and ceilings. Any damaged ceiling tiles, floor, and carpet shall be replaced to match color, size, style, and texture.

1.18 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Storage: Contractor shall provide secure material storage. All equipment provided by the Contractor remains the responsibility of that Contractor until substantial completion of the work.

B. Protection: Contractor shall take all necessary precautions to protect materials from the following:

1. Theft
2. Vandalism/Tampering
3. Dents
4. Scratches
5. Dust
6. Temperature
7. Weather
8. Cutting
9. Paint
10. Other hazardous conditions

C. Replacement: Contractor shall replace any damaged or lost material.

D. Installed Materials: Installed materials remain the responsibility of the Contractor until Acceptance. Contractor shall take necessary precautions to ensure the safety and security of installed materials.

1.19 INTERFERENCE WITH THE FACILITY

A. Transportation and storage of materials at the facility, work involving the facility, and other matters affecting the habitual use by the Owner of the Owner’s buildings, shall be conducted to minimize interference, and at times and in a manner acceptable to the Owner.

1.20 SAFEGUARDS AND PROTECTION

A. Barriers: Provide and maintain suitable barriers, guards, fences and signs where necessary to accommodate the safety of others relative to and/or for the protection of this work.

B. Regulations: Comply with OSHA, Federal, State, Local, and Owner regulations and standards pursuant to this work.

C. Protection: Protect all materials and equipment to prevent the entry or adhesion of any and all foreign material. If necessary, cover equipment with temporary protective material suitable for this purpose.

D. Finishing: Check, clean and remove defects, scratches, fingerprints and smudges if necessary from all equipment and devices immediately prior to Acceptance of the Installation.

E. Damage: Replace all damaged or defective material or work at no additional cost prior to Final Acceptance.

F. Documentation: Provide written description of accidents by workers, staff, and general public of any incident occurring on the project. Report incident in writing to Owner's representative immediately and to the Project Manager for follow up.

1.21 OWNER- FURNISHED PRODUTCS

A. Delivery: Owner is responsible for delivery of Owner-furnished products to the project site, unless otherwise specified in this document.

B. Placement: Contractor is responsible for locating, inspecting, and moving Owner-furnished products to their final installation position.

C. Inspection: Contractor shall report any damage, discrepancies in quantity, type, or function to Owner and Consultant immediately upon discovery.

D. Warranty: Contractor assumes no responsibility for any material warranty for Owner-furnished products. Contractor shall be responsible for integrating, cabling, and installing Owner-furnished products under the same warranty conditions as other products furnished by Contractor.

1.22 QUALITY ASSURANCE

A. Assurance: It is the intent of these specifications to describe and provide for a complete, professional, and reliable installation.

B. Qualifications: Contractor employees who are engaged in installation shall be properly trained in the tasks they are expected to perform.

C. Acceptability: Owner shall determine the acceptability of work.

D. Regulatory Requirements: Contractor shall comply with code requirements that apply to the work being performed.

E. Certifications: Where manufacturer certifications are required for warranty or for authorized resale, installation personnel shall have received such certification prior to the start of installation of those manufacturers' materials.

1.23 QUALITY CONTROL

A. Installation: During installation period, when connections are made to the Owner’s existing infrastructure, Contractor shall use care to ensure that such connections will not have a negative impact which could reduce or hamper existing systems.

1.24 INTELLECTUAL PROPERTY OWNERSHIP

A. All intellectual property shall remain in escrow for an unlimited period of time. All supporting documentation, including but not limited to: software, firmware, programming, uncompiled source code, graphic files, diagrams, written and electronic files, including all latest versions of the documentation and software necessary to edit and adapt the system(s), shall be provided to the Owner on a CD or DVD for all spaces and all systems. The integrator and/or programmer shall also maintain a current live copy incorporating all system modifications to be provided at the Owner’s request and for system restoration upon a failure.

B. A written release shall be given by the Contractor and all other required parties for all programming and configuration done by the Contractor and/or Subcontractors. This release will acknowledge the Owner's ownership and right to modify the intellectual property directly, or to have the intellectual property modified by any party of the Owner’s choosing.

PART 2 - PRODUCTS

2.01 BASIC EQUIPMENT AND MATERIALS REQUIREMENTS

A. Standards: Equipment and materials used to accomplish the goals of this project shall meet standards for good engineering practice as defined within this document.

B. Quality: Products specified in these documents are intended to establish a baseline or operational, functional, and performance-based standards that all proposed products shall meet or exceed by functionality and quality.

2.02 FACTORY-ASSEMBLED PRODUCTS

A. Manufacturer: Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

B. Age of Equipment: Equipment shall be new and unused with full manufacturer’s warranties. Contractor shall supplement such warranties as required by the specification. Contractor shall immediately notify Consultant of any product that will be or is expected to be discontinued by the end of the project for resolution.

C. No Modification: Where a product is available from a factory/manufacturer to meet the needs as outlined, that product shall be used without modification to ensure the full factory warranty is maintained.

D. Like Materials: Like materials used shall be of the same manufacturer, model, and quality unless otherwise specified.

E. Software/Firmware: No software or firmware is to be used unless specifically authorized by Owner or its appointed representative.

2.03 RACKS, CABINETS, HARDWARE

A. Equipment Racks and Cabinets: Provide racks and cabinets as specified herein and/or described in accompanying documents, appendices, or drawings. Verify that any existing racks and/or cabinets provided by others are complete, bringing any discrepancies to the attention of Owner and Consultant prior to beginning the installation.

B. Shelves and Mounts: Contractor shall supply necessary mounting hardware to install rack-mounted equipment. Mounting hardware shall be a product of the manufacturer of the equipment to be mounted, or manufacturer of the rack system, or approved by either for use with their product. Provide supporting channels, shelves, rack mounts, and/or rack ears as recommended by equipment manufacturers.

C. Screws and Washers: Contractor shall provide screw head types appropriate to the level of security required for the equipment and racking. Screws shall include polyethylene or nylon washer.

1. Public Access Areas: Star post or square post security screws shall be used for hardware and equipment mounted in equipment racks and consoles in areas that are accessible to the public.

2. Restricted Access Areas: Philips head screws may be used where a secure room entrance or locked rack/console door prevents public access.

2.04 POWER DEVICES

A. Power Strips: Unless otherwise specified, power strips shall be UL listed, surface mounted, and rated for 20 amp continuous electronic loads. Outlets shall be 125 volt, 20 amp, three-wire, grounded, and NEMA 5-20R compliant. Cords shall be 12/3 SJT with molded plug.

B. Power Distribution Panels: Unless otherwise specified, power distribution panels shall be UL listed, rack mounted, rated for 20 amp continuous electronic loads, with switch and pilot light. Up to eight outlets shall be mounted to the back, each rated 125 volt, 20 amp, three-wire, grounded, and NEMA 5-20R compliant. Switch and pilot shall be mounted to the front. Cords shall be 12/3 SJT with molded plug.

C. Contractor shall provide acceptable power distribution units as required in order to provide sufficient outlet connectivity for Contractor-furnished and Owner-furnished equipment indicated on drawings and equipment schedules, plus up to 15% additional capacity for future growth. This may be in addition to any power distribution equipment indicated on equipment schedules.

2.05 CABLE AND CONNECTORS

A. Cable: Cable shall be selected and applied in a manner defined by signal type, consistent with best industry practices. Highest quality products shall be used with attention given to transmission characteristics, termination methods, resistive and complex impedance at operating frequencies, and insulating material characteristics. Where required by the NEC, substitutions of air handing plenum cable shall exactly match the normally applied product and shall meet the standards of UL Standard #900 and the NEC Articles 800 and 820.

B. Connectors: Highest quality products shall be used with attention given to transmission characteristics, termination methods, resistive and complex impedance at operating frequencies, and insulating material characteristics. Strain reliefs and cable clamps shall be sized for the connector and the cable.

C. Color: Cable and connector color shall be coordinated with Consultant to maintain consistency with cable and connector color schemes used by other trades.

2.06 CABLE MANAGEMENT

A. Plastic Cable Ties: No nylon or plastic cable ties are allowed.

B. Velcro Cable Ties: Velcro straps shall be used for all signal and DC cables. Velcro straps shall be black, with no logo or decoration, except as authorized by Consultant.

C. For all Plenum spaces use Red Velcro straps with no logo or decoration, except as authorized by Consultant.

2.07 ANCILLARY HARDWARE

A. General: Contractor shall provide ancillary and required accessory items necessary to provide a complete and fully functional system to Owner.

B. Interpretation: Exclusion of or limitation in the language used in the drawings or specifications shall not be interpreted as meaning that ancillary or accessory items of work or equipment necessary to complete or make the installed system fully functional can be omitted.

2.08 GROUDNING HARDWARE

A. Refer to Section 27 05 26 for specific Grounding and Bonding requirements.

B. Provide data/telecommunication grounding systems indicated in the project drawings and specifications. Products shall include, but are not limited to, cables/wires, connectors, terminals, compression lugs, grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, ANSI/TIA and established industry standards for applications indicated.

2.09 FIRE STOPPING MATERIALS

A. Should the Contractor find it necessary to penetrate any walls extending to the slab, it will be the responsibility of that Contractor to provide satisfactory sleeving and fire caulking both inside and outside of the sleeving. If existing sleeving is to be utilized, it will be the responsibility of the Contractor to the fire Contractor to fire caulk inside the sleeving.

B. The Contractor is responsible for adhering to the following standards:

1. Conduit penetrations through fire-rated or smoke walls: Completely seal around the conduit penetration with Hilti FS 601 fire-rated sealant or equivalent by Tremco, 3M or equal.

2. Conduit sleeves through fire rated or smoke wall: Completely seal around the conduit penetration with Hilti FS601 fire-rated sealant or equivalent by Tremco, 3M, or equal. Completely seal inner opening of the conduit sleeve with fire wool packing and Hilti FS 611A intumescent firestop sealant.

3. Cabel bundles through fire-rated or smoke walls (without sleeves): STI EZ Path Series 44. Match capacity of Cable tray.

4. Cable tray penetration through fire-rated or smoke walls: STI EZ Path Series 44. Match capacity of Cable tray.

2.10 COMPATIBILITY OF RELATED EQUIPMENT

A. Installed Equipment: Specified equipment and systems shall be compatible with all other equipment and systems as offered by Contractor, thus placing the responsibility on Contractor to ensure proper interaction.

2.11 LICENSES

A. Any and all licenses required for system functionality shall be provided.

2.12 MAINTENANCE MANUALS

A. Contractor shall produce a maintenance manual showing interconnection of equipment and any special procedures necessary for proper operation and maintenance of the systems.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall provide, furnish, deliver, transport, erect, install, connect and configure all of the material and equipment described herein or depicted on any bid package document or drawing, as required for a complete solution.

3.02 COORDINATION

A. General: Contractor shall coordinate with other trades for proper provisioning, anchorage, placement, and execution of all work. Interference between the work of various trades shall be resolved before installation. In the event of conflict on space requirements or location of devices, refer the matter to Owner and Consultant for decision.

B. Related Work: References to the following related work do not limit or release Contractor from the responsibility of coordination with other trades or from having the necessary knowledge of other non-referenced work.

1. Work by General Contractor.
2. Work by other Technology Contractors.
3. Work by Electrical Contractor, including electrical rough-ins and surface-mounted raceway.

C. Delays: Contractor shall coordinate with all other trades to avoid causing delays in the installation schedule.

D. AC Power: Contractor shall coordinate requirements for proper AC power to service all equipment installed by Contractor.

E. Low Voltage Sleeving: Contractor shall provide openings through walls as necessary, with sleeving and fire-stopping materials installed in a professional manner to meet local and national codes.

F. Grounding and Bonding: Contractor shall coordinate requirements for proper grounding and bonding to their equipment.

G. Surface-Mounted Raceway Coordination

1. Verification: Contractor shall field verify and coordinate the proposed use of surface-mounted raceway at any location.

3.03 BASIC EXECUTION REQUIREMENTS

A. General: Contractor is responsible for following industry standards of good practice for telecommunications and networking equipment.

B. Aesthetic Factors: With the installation of equipment and cables, consideration shall be given not only to operational efficiency but also to overall aesthetic factors. Contractor shall redo, at no cost to Owner, any work deemed by Owner to appear sloppy, hastily done, or unprofessional. Owner shall make final decision over whether work shall be redone.

C. Manufacturers' Recommendations: Manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by the manufacturers or as indicated in their published literature unless otherwise noted herein.

D. Protection of Work Area: Work shall be properly protected during construction; including shielding soft or fragile materials, protecting against dust and dirt, protecting and supporting cable ends off of the floor and from other traffic, protecting floor box lids, and temporarily plugging open conduits during construction. Upon completion, installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of work shall be removed from the premises.

E. Protection of Cable and Equipment: Contractor shall make appropriate preparations to protect all cabling and equipment from foreign material.

1. Foreign material is defined as any substance or material that would void the manufacturer's performance warranty, impact ratings (UL, Plenum, etc.), or cover up markings needed for inspection.

2. Foreign material includes, but is not limited to, paint overspray (intentional or not), fire-stopping material, drywall compound, or any other chemical, liquid, or compound that could come in contact with cables, cable jackets, cable termination points, or other equipment.

3. Cleaning of cables or equipment from a failure to comply with Protection of Cable and Equipment clause is unacceptable. Contractor shall replace any affected cable, cable components, or equipment in their entirety at Contractor's sole cost.

    a. i.e. Painted cables. Jacks and faceplates shall be replaced in their entirety at no cost to the Owner.

F. Waste Materials: Contractor shall keep work area neat, orderly, and free from accumulation of waste materials. Remove trash and debris from the building and job site as required to maintain a clean work environment at all times. Rubbish shall be moved to a common trash point or receptacle on the job site.

G. Ceiling Grid: Contractor shall not hang cable supports from ceiling grid wire.

H. Roof Deck: Contractor shall not shoot into the roof deck for mounting cable hangers.

I. Mounting: Equipment and enclosures shall be mounted plumb and square in relation to the structure.

J. Flexible Furniture: Care shall be taken to properly dress all cables placed within flexible or re-configurable furniture to provide sufficient cable length and strain relief to allow full range of travel for flexible furniture configurations.

3.04 PREPARATION

A. Existing Equipment: Prior to any installation, prepare the site by removing any remaining debris, leveling equipment racks (where appropriate), and verifying information and systems stated to be in-place are ready for use.

B. Equipment for Installation: Prior to installation, ensure that required major equipment has been secured and is ready for installation.

3.05 CLEANING

A. Reference Division 01 Section for "Contractor Site Rules"

3.06 DEMOLITION

A. General: The Contractor shall be responsible for removal, collection, transportation, and recycling of all cabling and components that become abandoned as a result of this project. This shall include the delivery of cable and components to the proper recycling centers. If material is to remain on site for more than seven days after removal, Contractor shall coordinate with Owner for an acceptable storage location.

B. Verification: Contractor shall field-verify existing conditions prior to beginning demolition work. Any discrepancies shall be reported to the Consultant prior to the start of work in order to prevent disturbance of existing installation(s). Beginning work shall indicate acceptance of existing conditions. Contractor is responsible for immediately restoring any outages caused as a result of removing or damaging adjacent cabling, systems, or services.

C. Abandoned Cable: The Contractor shall remove all abandoned cable back to the headend. Where it is not possible to remove cables without damaging other cables that are to remain, such as in a shared conduit, the Contractor shall report these conditions to the Consultant for approval. These cables shall be cut at entry and exit points, leaving a minimum of 24” of cable at each end.

D. Cover Plates: The Contractor shall provide and install blank cover plates for any outlets or junction boxes that are to be left in place and from which all cables have been removed. Cover plates shall match the Project standard color and finish.

E. Equipment: The Contractor shall remove all equipment abandoned as part of this project. The Contractor shall be responsible for the delivery of this equipment to a proper recycling facility. Any electrical service connected to the equipment shall be properly decommissioned and labeled to prevent any safety issues.

F. Right of Refusal: The Owner shall have first right of refusal to any abandoned cable or equipment. The Owner has the right to remove any components from the equipment before it is recycled.

3.07 FIRE STOPING

A. Contractor is responsible for applying fire-stopping material in and around all openings that it creates or are created for it, whether specifically indicated in specifications or project drawings, where code requires the use of fire stopping material.

B. Contractor shall ensure that all fire-stopping materials meet appropriate codes and are installed in a neat and workman like manner.

3.08 WATERPROOFING

A. Contractor is responsible for creating a waterproof seal in and around any openings to the outside environment that are created by Contractor or for systems being installed.

B. Contractor shall ensure that all waterproof materials meet appropriate codes and are applied according to good engineering practice.

3.09 RACKS, CABINETS, AND HARDWARE

A. Racks and Cabinets: Contractor shall assemble and install racks and cabinets.

B. Installation Hardware: Install hardware in a secure manner. Screws shall be tightened to a torque just sufficient to secure equipment without deforming washers beyond their original diameter.

C. Considerations: Rack mount equipment shall be secured as recommended by the manufacturer with consideration to airflow, power, and in/out connections.

D. Cross Connections: Where cross connections are required between equipment, interconnections shall be installed using cable management devices to secure cables in a neat and workmanlike manner, applying best industry practices.

3.10 INSTALLATION REQUIREMENTS

A. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed.

B. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to ensure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a "break-away", or other approved method.

C. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of pathway entry and exit.

D. All cable shall be free of tension at both ends.

E. PLENUM rated cable shall be used in areas used for air handling or where required by code.

F. Contractor shall replace any cables that have been damaged or abraded during installation.

G. Pulling lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used and will not harden or become adhesive with age.

H. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit or surface mount raceway.

3.11 CABLE

A. Cable treatment: Cable shall be stored and handled to assure that it is not stretched, kinked, crushed, or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or recommendations. Cable shall not be installed in ambient temperatures or moisture conditions above or below the rating of the manufacturer.

B. Splicing

1. Voice, data, and other twisted pair cables: No splices shall be installed in any voice, data or twisted pair cables.

2. Technology systems: No splices shall be installed in any cable less than five hundred (500) feet in length.

3. Digital multimedia/video cables: No splices are allowed in any digital multimedia/video cable.

4. Overhead paging systems: Cable splices for constant voltage overhead paging system shall occur only at speaker, amplifier or volume control knob locations.

C. Lengths

1. Variations: Where cables are to be of the same length, variations in the length shall be less than plus or minus ½ inch. Lengths of cables are based on the length of the unterminated signal conductors.

2. Labeling: Cables, regardless of length, shall be marked with a labeling scheme approved by Consultant.

3. Service Loops: A surplus of cable, located at or near the point of termination to facilitate potential future changes, shall be provided where appropriate. Cables shall have a minimum cable slack of 10ft (3m) at the telecommunication room(s) and 10ft (3m) at each telecommunications outlet in the suspended ceiling unless noted otherwise.

4. Service loops shall be stored in an extended loop in the telecom room.

5. Service loops shall be stored in a figure-eight configuration at each outet location, not in bundle loops.

6. Coordinate with Owner and Owner's representative.

D. Grouping

1. Cables shall be separated into like groups according to signal or power levels.

2. Power Cable Group: Power cables shall be secured to one side of the rack separate from any low-energy signal cable groups. Separation shall be a minimum of 4" in all directions.

3. Signal Cable Group: Signal cables shall be grouped according to signal type and secured to one side of the rack separate from any power cable groups. Separation shall be a minimum of 4" in all directions.

E. In Equipment Racks

1. Equipment rack wiring and cabling shall be neatly dressed.

2. Fastening: Rack cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame.

F. Support for Cables Outside of Equipment Racks

1. External wire and cables shall be supported at least every 5 feet (1.5m) from the structure and as required to maintain less than 12 inches of cable sag between supports without over-tensioning the cables. Contractor shall vary the precise distance between cable supports on long runs to avoid harmonics issues.

2. Hardware: Cables shall be supported by J-hooks, cable tray, or ladder rack. Hardware shall be secured to building structure using 3/8" threaded rod supports.

3. Right Angles: Cables are to run at right angles to the structure, placed above ceiling in halls or corridors.

4. Height: Cables shall not run above red iron joist.

G. Concealment: Contractor shall make every effort to conceal wiring and other apparatus into walls, floors, and ceilings, assuming code and good engineering practice allows and suggests. Cabling systems installed in public areas shall be installed within walls, ceiling, or floors or within surface wiring pathways, as dictated by codes and good engineering practice.

H. Velcro Straps for Horizontal Cabling: Straps shall be installed snugly without deforming cable insulation. Straps shall be spaced at uneven intervals not to exceed 4 feet.

I. Velcro Straps within Equipment Racks and Cabinets: Ties and straps shall be installed snugly, without deforming cable insulation, at uneven intervals not to exceed 8 inches.

J. No cable ties are allowed or are to be utilized on the technology systems and subsystems.

K. Contractor shall notify immediately if any obstruction or hazard is discovered in a pathway provided by others.

3.12 CONNECTORS

A. Preparation: Cables shall be carefully prepared and connectors installed as directed by the manufacturer. Proper stripping devices and crimping tools shall be used.

B. Terminations: Connectors shall be carefully fitted to mating devices on equipment to avoid damage to mating contacts, inserts, or bodies. Specialized terminations shall be made in a neat and secure manner suited to the service of the wire and as directed by the manufacturer. Contractor shall use manufacturer specified terminations when those specifications exist.

C. Soldering: A person skilled in that practice shall execute soldered terminations. Any excessive insulation displacement resulting from soldering shall be grounds to require the Contractor to re-terminate the connector.

D. Adapters: Adapters shall be used only where the identity of the necessary type of connector is unknown at the time of installation, such as for Owner-provided equipment or in anticipation of future equipment upgrades, with Consultant's approval.

3.13 SPARE PARTS AND REMOTE CONTROLS

A. Keys: Contractor shall turnover all keys, tagged and organized by type on individual key rings, to Owner upon project completion.

B. Refer to individual sections for spare parts and remote control requirements.

3.14 EQUIPMENT INSTALLATION

A. General: Contractor shall make system properly operational and physically secure by mounting equipment and related accessories into furniture, consoles, and racks as required. Manufacturer's guidelines for installation shall be followed. Discrepancies in installation procedure or inability to complete a given task due to a shortage of materials or malfunctioning equipment shall be reported to Consultant immediately upon discovery.

B. Equipment Placement: Contractor shall locate equipment as indicated on drawings and as specified herein. Where such information is not provided, Contractor shall follow industry best practices and locate operable devices at convenient positions; heat generating devices at the top and seldom-accessed equipment below.

1. Unless otherwise specified, end user-operable devices shall be positioned within the range of front wheelchair access per ADA standards.

2. Coordinate with Owner before equipment placement.

C. Equipment Installation: Equipment shall be installed as directed by the manufacturer using equipment manufacturer's desktop mounting frames, equipment tubs, installation hardware, and techniques. Contractor shall be responsible for moving equipment from storage and for providing necessary personnel or devices to carry and lift equipment around obstacles and into operating position.

3.15 FIRMWARE

A. Firmware shall be latest version supported by software and/ or equipment as of Date of Acceptance.

3.16 ROUGH-IN

A. Scheduling: Contractor shall make every effort to install systems per this specification in a timely manner including rough-in of cabling and other apparatus where appropriate to stay on schedule.

B. Protection of Environment: Where cabling and/or equipment is installed prior to other trades completing their work in an area, Contractor shall take necessary precautions to cover, wrap, or otherwise protect to reduce possible damage which may result from plastering, painting, cleaning, or other such work completed after installation and before substantial completion of the project.

3.17 CUTTING, DRILLING, PATCHING AND PAINTING

A. Coordination: Coordinate with other trades when any cutting or drilling is required for the installation or proper performance of the specified systems.

B. Restoration: Contractor is responsible for returning all surfaces (including walls, floors, and ceilings) to their previous condition after any cutting.

3.18 LABELING

A. General: Rack-mounted equipment and hardware shall be labeled as required herein. Connectors, jacks, receptacles, outlets, cables, cable terminations, terminal blocks, rack mounted equipment, active slots of card frame systems, etc. shall be clearly, logically, and permanently labeled in a manner acceptable to Consultant.

B. Approval: Proposed wording and/or numbering schemes for labeling shall be provided for review and written approval prior to procurement or installation.

C. Labels used shall be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:

1. Like Size: All labels, including engraved labels, shall be sized to match other labels used for same purpose.

2. Equipment Racks: For enclosed racks containing equipment, provide labels on each equipment rack rear door or console rear panel reading “No user serviceable parts. Refer service to qualified technician.”

3. Installer and Consultant Identification: Position at the front top center section of each equipment rack a label that states the names of system Installer and Consultant.

4. Custom Panels: Custom panel nomenclature shall be engraved, etched, or screened. Markings are to be designed to ensure consistency and clarity within and without of system. Verify markings and placements by submitting label sample layouts to Consultant for approval prior to procurement.

5. Above Ceiling Locations: Position on ceiling tile grid (Black on White Label) to identify data drips above ceiling. Coordinate with Owner and Consultant. All data drops are identified with Pink Dots on the ceiling grid.

6. Popit locations are identified with a Green dot on the ceiling grid.

7. Documentation: Labeling information shall appear on the Record Drawings.

3.19 FIRE-STOPPING

A. If Contractor removes anything from an opening in a fire-rated wall, Contractor shall restore the fire-rating condition of the wall to the same condition as before Contractor started its work. Depending on the size of the opening, this may involve sheetrock patching, in addition to use of other appropriate fire-stopping materials

3.20 TESTING

A. Procedure: Shall develop a rigorous testing procedure to ensure full functionality and durability of installed systems under heavy-use conditions.

B. Supplies: Shall supply testing equipment needed to verify compliance with specifications found in these documents.

C. Schedule: Shall complete required testing prior to the substantial completion inspection by Owner and Consultant.

D. Data: Test data shall be properly documented and recorded so that it is available for final inspection.

E. Quality Control: Testing may be repeated during the inspection process at the request of Owner or Consultant.

F. Prior to energizing or testing the system, Contractor shall ensure the following:

1. Installation: Products are installed in a proper and safe manner per the manufacturer's instructions.

2. Cleanliness: Products are neat, clean, and unmarred, and parts securely attached. Dust, debris, solder, splatter, etc., is removed.

3. Cables and Connections: Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

4. Grounding: Electronic devices are properly grounded.

5. AC Power: Each AC power receptacle is tested with a circuit checker for proper hot, neutral, and ground connections prior to connecting equipment.

3.21 GROUNDING

A. Refer to Section 27 05 26 for specific Grounding and Bonding installation requirements.

3.22 TRAINING PROGRAM

A. Contractor shall provide training in the manner delineated below in addition to specific requirements identified in subsequent sections.

B. Contractor shall provide audio-video recording of each training session to Owner.

C. Prior to scheduling or delivering End User training, Contractor shall confirm that:

1. Closeout submittals have been accepted by Owner and Consultant.

2. Final closeout inspection has been completed and punch list items rectified.

3. Training schedule dates have been coordinated with and approved by Owner and Consultant.

D. Training shall include:

1. Approved handouts.
2. Practical and comprehensive operation of systems.
3. Basic system troubleshooting techniques.
4. Basic system maintenance.

E. Training Blocks

1. Training time is defined as those hours specifically set aside for the sole purpose of training end users. Credited time will not be given for any time spent providing instructions to the Owner's staff for a system not completed or that has not passed final acceptance by the Owner and Consultant, or training performed outside of the approved training program.
2. This training will be divided into training session "Blocks" as coordinated with the Owner.
    a. The first training session block shall consist of training intended for the common system operators. Such training, at a minimum, shall include the day to day use of the system.
    b. The second training session block shall consist of training administrators of the day to day administration of the system. Such training, at a minimum, shall include use of the administration control functions of the systems, user setup, and filtering and pulling reports.
    c. The third training session block shall consist of training administrators on system troubleshooting, maintenance, and updates. Such training, at a minimum, shall include using the system tools to diagnose issues, diagnosing common physical equipment issues, performing simple maintenance, and performing system updates.
    d. The forth training session block shall consist of a training session structured for high-level users, for example staff trainers who will provide instruction to other users and will include advance system configuration and operational knowledge needed to maintain and manage all specified technology systems. The Contractor may elect to engage the Manufacturer(s) in certifying the high-level end users in the systems at no cost to the Owner.

F. The Contractor shall issue a certificate of training completion to the trainees upon completion of their training. Such certificates must be signed by both the trainer and trainee(s) for the Contractor to receive training credit.

3.23 WARRANTY

A. Contractor shall provide a warranty conforming to the stipulations below in addition to specific requirements identified in subsequent sections.

B. As part of the base proposal cost, the Contractor shall include a 3-year warranty period with full support costs.

C. The Warranty period shall begin after all punch list items have been rectified. The Contractor shall receive a letter of completion from the Consultant and Owner indicating project completion and starting the warranty period.

D. The warranty and support work included in this contract shall cover the following materials, software, and services, without additional cost to the Owner:

1. Inspections, preventative maintenance, and testing of equipment and components. The Contractor shall schedule a 10-month on-site preventative system review 10-months into each year of warranty and support including system inspections, preventive maintenance, software upgrades/patches, and testing of equipment and components.

2. Regular Service, Emergency Service, and Normal Service.

3. Labor, travel, equipment, materials, and transportation cost for all services covered by this warranty.

E. Response Time: Contractor shall respond to calls for warranty services in a timely manner as delineated below.

1. The Owner reserves the right to make the final determination of emergency or normal service calls and the right to coordinate the best times for service of any system failure.

2. Emergency service calls are defined as failures which prohibit the use of a typical system function(s) and pose a life safety concern, or such failures which cause a major impact to the Owner's daily operations.

   a. The Contractor shall provide remote service diagnosing the impact within two (2) hours after notification by the Owner.

   b. If remote service does not correct the reported issue, the Contractor shall provide on-site service correcting the impact within four (4) hours after notification by the Owner.

3. Normal service calls are defined as failures which prohibit the use of typical system function(s) but which do not inhibit critical system usage, do not pose life safety concerns, and do not create a major impact to Owner's daily operations.

   a. The Contractor shall provide remote service correcting the impact within twenty-four (24) hours after notification by the Owner.

   b. If remote service does not correct the reported issue, the Contractor shall provide on-site service correcting the impact within forty-eight (48) hours after notification by the Owner.

4. The Contractor shall supply Service Request forms and or proper contact procedure to the Owner with instructions for proper notification of the Contractor for warranty service. By following said instructions, the Owner shall constitute proper notification for any needed warranty service

F. Repair Time: Contractor shall locally stock critical parts in sufficient quantities such that emergency repair or replacement shall be guaranteed within twelve (12) hours. Temporary replacements within this time period shall be acceptable, provided temporary replacements do not compromise system functionality and provided permanent replacement is achieved within ninety-six (96) hours. Contractor may contact the Owner for use of Owner supplied spare parts where delay of system repair will have negative impact on system performance.

G. Transmittal: A copy of this Warranty shall be delivered to and signed for by the Owner's representative whose primary responsibility is the operation and care of these systems. A copy of the signed Warranty document shall be delivered for review as part of the Final Submittals.

H. Registration: Contractor shall register Warranty papers for all equipment and software in the name of the Owner and furnish reproductions of all equipment Warranty papers to the Owner with the Final Submittals.

I. Subcontracting: Warranty service work may not be subcontracted except with specific permission and approval by the Owner.

1. Service/Warranty Procedures: Contractor shall submit a warranty service plan containing all contact information and Owner service call directions for Owner review with project close-out submittals.

J. Resolution of Conflicts:

1. The Owner retains the right to resolve unsatisfactory warranty service performance at any time by declaring the work unsatisfactory and stating specific areas of dissatisfaction in writing.

2. If the Contractor or his approved Subcontractor does not resolve such stated areas of dissatisfaction within ninety-six (96) hours, the Owner may appoint an alternative service agency or person to fulfill the terms of the Warranty at the expense of the Contractor. This action may be taken repeatedly until the Owner is satisfied that Warranty service performance is satisfactory. Satisfactory resolution of a malfunction shall be considered adequate when the device, equipment, system or component which is chronically malfunctioning is brought into compliance with the standards of performance as contained herein and published by the manufacturers of the equipment installed.

SECTION 27 05 00

COMMUNICATIONS GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Section, apply to this Section.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. This section describes the products and execution requirements related to furnishing and installing Category 6a Cabling and Termination Components and related subsystems as part of a Structured Cabling System.

C. Backbone system compromising fiber optic cabling and horizontal (station) cabling is covered under this specification.

D. The owner, under separate contract, will provide the network electronics for the LAN within the Telecom Rooms (TRs) and will be responsible for connecting the new cabling infrastructure to the LAN. The Contractor, however, shall supply the patch cords. The Contractor shall be available on site during the crossover to assist with any cabling issues that may occur during the connection.

E. Conduits and surface raceway for new technology outlet locations shall be installed in accordance with the provisions of Division 26 – Electrical Contractor unless otherwise noted.

F. Provide and install all sleeves through the wall penetrations as required, whether specifically marked on Project Drawings, unless otherwise noted.

G. All cables and related terminations support, and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in the following section(s).

1. Section 27 05 23 – Pathways for Technology Systems
2. Section 27 05 26 – Grounding and Bonding for Technology Systems
3. Section 27 11 00 – Communications Equipment Rooms
4. Section 27 13 00 – Communications Backbone Cabling
5. Section 27 15 00 – Communications Horizontal Cabling
6. Section 27 16 00 – Communications Connecting Cords
7. Section 27 18 00 – Communications Labeling and Identification

H. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Electrical Code in the state where the work is to be performed, and present manufacturing standards.

I. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply

and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 23 – Pathways for Technology Systems

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 11 00 – Communications Equipment Rooms

E. Section 27 13 00 – Communications Backbone Cabling

F. Section 27 15 00 – Communications Horizontal Cabling

G. Section 27 16 00 – Communications Connecting Cords

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 40 00 – AV/Multimedia General Requirements

J. Section 27 41 00 – Audio Visual Systems

K. Section 27 60 00 – Physical Security General Requirements

L. Section 27 61 00 – Command and Control Systems

M. Section 27 62 00 – Electronic Access Control System

N. Section 27 64 00 – Video Surveillance System

O. Section 27 66 00 – Intrusion Detection System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCES STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

B. All references relate to the current version adopted by the city/county according to the authority having jurisdiction (AHJ). If the city/county has not adopted a version the latest version shall be utilized.

C. ASTM B633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel

D. ASTM A653: Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process

E. ASTM A123: Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel

F. ASTM A510: Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

G. ANSI/TIA 569-C: Telecommunications Pathways and Spaces

H. ANSI/TIA 568-C.0, 1, 2, 3, 4: Commercial Building Telecommunications Standard

I. ANSI/TIA-598-C-2005 – Optical Fiber Cable Color Coding

J. ANSI/TIA 606-B: Administration Standard for Telecommunications Infrastructure

K. ANSI/TIA 942-A: Telecommunications Infrastructure Standard for Data Centers

L. ANSI/TIA 607-B: Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises

M. IEEE: National Electrical Safety Code® (NESC®)
standards.ieee.org/about/nesc

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

B. Premises Distribution System: Written certification that the premises distribution system complies with the EIA ANSI/TIA/EIA-568-C.0,1, 2, 3, EIA ANSI/TIA/EIA-569-B, and ANSI/TIA/EIA-606-A.

C. Materials and Equipment: Where materials or equipment are specified to conform, be constructed, or be tested to meet specific requirements, Contractor shall supply, upon request by Consultant or Owner, certification that the items provided conforms to such requirements. Certification by a nationally recognized testing laboratory that a representative sample has been tested to meet the requirements, or a published catalog specification statement to the effect that the item meets the referenced standard, will be acceptable as evidence that the item conforms. Compliance with these requirements does not relieve the Contractor from compliance with other requirements of the specifications.

D. Certifications

1. The Contractor shall have an RCDD (Registered Communication Distribution Designer) on staff assigned to manage this Project; documented proof shall accompany the proposal response.

2. All installing personnel shall have completed and be certified in manufacturer training or BICSI (Building Industry Consulting Service International) installation training for UTP infrastructure systems.

3. All installing personnel shall have completed and be certified by the manufacturer as a CommScope Uniprise Certified Installer.

4. CommScope Uniprise Company Certifications shall accompany the proposal and submittal request.

5. The Contractor’s technicians shall be certified and trained in the connectivity hardware which is being installed.

6. The Contractor shall submit certification that installers are factory certified to install and test the provided products. No less than half of the crew to be used for the telecommunications installation shall be trained by that manufacturer for the work.

1.07 SUBMITTALS

A. Shop Drawings in addition to requirements in Section 27 00 00:

1. Equipment rack elevation details

2. Elevations of telecommunication room walls with planned mounted equipment

3. Outlet faceplate details for all outlet configurations, sizes, and cable types

4. Overhead telecommunication room enlargements, providing dimensions of room and clearance for maintenance and operation

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for requirements.

1. Data cable test results

2. CD containing:

a. As-built drawings (CAD format)

b. As-built drawings (PDF format)

c. Detailed test results in original tester format (e.g. Fluke Linkware)

d. Detailed cable test results in PDF format

e. Warranty certification from connectivity manufacturer

1.10 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for all materials until completion of Project.

B. Cable shall be stored according to manufacturer's recommendations at minimum. In addition, cable shall be stored in a location protected from vandalism and weather.

C. If cable is stored outside, it shall be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees Fahrenheit, the cable shall be moved to a heated (minimum 50 degrees Fahrenheit) location. If necessary, cable shall be stored off site at the Contractor's expense.

D. Commercial off-the-shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of the premises distribution system. Specification sheets for all cable, connectors, and other equipment shall be provided.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 FIRE STOPPING MATERIALS

A. Refer to Section 27 00 00 for additional requirements.

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

B. The Contractor shall provide to the Owner a manufacturer's 25-year minimum warranty certificate for all materials, equipment, etc. Upon successful completion of the installation and subsequent inspection, the Owner shall receive the numbered certificate from the manufacturing connectivity hardware (patch panels, jacks, parch cords 110 blocks, etc.) company registering the installation. This warranty shall include all labor, materials, and travel time.

C. The warranty shall ensure against product defects and guarantee that all approved cabling components exceed the specifications of TIA/EIA-568-C and ISO/IEC IS 11801 for cabling links/channels, and that the installation will exceed the loss and bandwidth requirements of TIA/EIA 568-C ISO/IEC IS 11801 for fiber links/channels for a twenty five (25) year period. The warranty shall apply to all passive structured cabling system components.

D. The warranty shall cover the failure of the wiring system to support the application that it was designed to support, as well as additional application(s) introduced in the future by recognized standards or user forums that use the TIA/EIA 568-C or ISO/IEC IS 11801 component and link/channel specifications for cabling. Such warranty shall apply for a minimum of a twenty-five (25) year period.

E. The warranty shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective products(s), labeling of the new components, and testing of the circuit(s) at no cost to the Owner.

3.04 EXAMINATION

A. Verification of Conditions: Contractor shall examine areas and conditions under which work is to be performed and identify conditions detrimental to proper and timely completion.

B. Contractor shall verify that cable lengths comply with published standards.

C. Contractor shall notify Owner of any proposed installation which is expected to exceed maximum lengths prior to installation of cable.

D. Contactor shall consult with Owner regarding alternative routing or location of cable.

E. Contractor shall not proceed until unsatisfactory conditions have been corrected.

3.05 SPARE PARTS

A. Suggested List: Contractor is requested to submit a list of suggested spare parts with an offered price, allowing Owner to select appropriate parts.

B. Means of Obtainment: Contractor shall state where spare parts can be obtained after the installation.

3.06 INSTALLATION REQUIREMENTS

A. Refer to Section 27 00 00 for additional requirements.

3.07 COOPERATION

A. The Contractor shall cooperate with other trades and General Contractor's personnel in locating work in a proper manner.

B. Should it be necessary to raise, lower, or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

3.08 TESTING AND ACCEPTANCE

A. The Contractor shall perform acceptance tests as indicated below for each subsystem (backbone, station, etc.) as it is completed.

B. The Contractor shall supply all equipment and personnel necessary to conduct the acceptance tests. Prior to testing, the Contractor shall provide a summary of the proposed test plan for each cable type, including equipment to use, setup, test frequencies or wavelengths, results format, etc. The Consultant will approve the method of testing.

C. The Contractor shall visually inspect all cabling and termination points to ensure that they are complete and conform to the wiring pattern defined herein. The Contractor shall provide the Consultant with a written certification that this inspection has been made.

D. The Contractor shall conduct acceptance testing according to a schedule coordinated with the Consultant. Representatives of the Owner may be in attendance to witness the test procedures. The Contractor shall provide a minimum of one (1) week advance notice to the Consultant and Owner to allow for such participation. The notification shall include a written description of the proposed conduct of the tests, including copies of blank test result sheets to be used.

E. Tests related to connected equipment of others shall be done only with the permission and presence of Contractor involved. The Contractor shall ascertain that testing only as required to prove the wiring connections are correct.

F. The Contractor shall provide Consultant with test results and descriptions of the testing methodology, including the date of the tests, the equipment used, and the procedures followed. At the request of the Consultant, the Contractor shall provide copies of the original test results.

G. All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the Contractor's expense. The applicable tests shall then be repeated.

H. The Consultant or Owner may request that a 10% random field re-test be conducted on the cable system to verify documented findings.

1. If requested, the Contractor shall test up to 10% of cable links at no cost to the Owner.

2. Tests shall be a repeat of those defined above and under Testing and Acceptance. If findings contradict the documentation submitted by the Contractor, additional testing shall be performed to the extent determined necessary by the Consultant, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

3.09 FIRE STOPPING

A. Contractor shall seal any openings created for cable pass-through between floors or through fire rated walls. Sealing material and application of this material shall be accomplished in

such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work.

B. Creation of such openings as are necessary for cable passage between locations as shown on the Drawings shall be the responsibility of the Contractor. Any openings created by or for the Contractor and left unused shall also be sealed as part of this work.

End of Section

SECTION 27 05 23

PATHWAYS FOR TECHNOLOGY SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Section, apply to this Section.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 11 00 – Communications Equipment Rooms

E. Section 27 13 00 – Communications Backbone Cabling

F. Section 27 15 00 – Communications Horizontal Cabling

G. Section 27 16 00 – Communications Connecting Cords

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 40 00 – AV/Multimedia General Requirements

J. Section 27 41 00 – Audio Visual Systems

K. Section 27 51 00 – Distributed Communications Systems

L. Section 27 60 00 – Physical Security General Requirements

M. Section 27 64 00 – Video Surveillance System

N. Section 27 66 00 – Intrusion Detection System

O. Section 28 13 16 – Electronic Access Control System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCES STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTLAS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 WIRE MESH CABLE TRAY

A. As shown on the Project Drawings, the Contractor shall provide and install sufficient wire basket tray runway systems to support horizontal cable bundles.

B. The Contractor shall provide all necessary labor, supervision, materials, equipment, tests, and services to install complete wire basket tray runway systems.

C. Wire basket runway systems shall include, but are not limited to, straight sections of continuous wire mesh, field formed horizontal and vertical bends, tees, drop outs, supports, and accessories.

D. Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

E. Contractor shall ensure that all straight section longitudinal wires are installed with no bends, kinks, or twisting.

F. Wire basket runway shall be made of high strength steel wires and formed into a standard 2-inch by 4-inch wire mesh pattern with intersecting wires welded together. All wire ends along runway sides (flanges) shall be rounded during manufacturing to prevent damage to cables and injury to installers.

G. All fittings shall be field formed as needed.

H. All splicing assemblies shall be the bolted type using serrated flange locknuts. Hardware shall be either yellow zinc dichromate in accordance with ASTM B633 SC2 or AISI Type 304 stainless steel. Splicing assemblies shall provide a continuous ground connection.

I. Wire Basket Tray shall be grounded only at the Telecommunications Room ground bus bar.

J. Cable Drop Out/Waterfall

1. Where cables bundles transition from tray to tray or tray to conduit or sleeve of varying elevations the Contractor shall provide and install a radius control device. This device shall

be a waterfall or drop out device and shall be properly sized to accommodate cable bundle plus 20% future growth.

K. Tray shall have an electro zinc finish or a flat Black finish wherever finished installation will be visible to end users.

L. Accessories (connectors, splice plates…) shall be Cablofil CF (or ZF) Series Cable Tray as manufactured by Legrand.

M. Cable tray shall consist of continuous, rigid, welded steel wire mesh cable management system to allow continuous ventilation of cables maximum dissipation of heat with UL Classified splices where tray acts as Equipment Grounding Conductor (EGC). Wire mesh cable tray will have continuous Safe T-Edge T-welded top side wire to protect cable insulation and installers.

1. Cable tray systems shall include, but are not limited to, straight sections, supports, and accessories.
2. Product: Cablofil CF (or ZF) Series Cable Tray as manufactured by Legrand.
3. Provide splices, supports, and other fittings necessary for a complete, continuously grounded system.
    a. Mesh: 2 by 4 inches (50 by 100 mm).
    b. Straight Section Lengths: 118 inches (3,000 mm).
    c. Wire Diameter: Patented design includes varying wire sizes to meet application load requirements, to optimize tray strength, and to allow tray to remain lightweight.
    d. Safe-T-Edge: Patented Safe-T-Edge technology on side wire to protect cable insulation and installers' hands.
    e. Fittings: Wire mesh cable tray fittings shall be field-fabricated from straight tray sections in accordance with manufacturer's instructions.
    f. Tape: Painted wire mesh cable tray to include metallic conductive UL tape.
4. Wire-Basket Depth: 4-inch (100-mm) usable loading depth.
    a. 12 inches (300 mm) wide.
5. Length: Cable tray section length shall be 118.1 inches (3000 mm) unless otherwise shown on drawings.
6. Cable Tray Material: Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture.
7. Load Span Criteria:
    a. Install and support cable management system in accordance with NEMA VE- 1, with Safety Factor of 1.5.
    b. Cable tray will be capable of carrying a uniformly distributed load of 25 pounds per foot on an 8-foot (2.4 m) support span, according to load tests of standard specified.
8. Fittings/Supports: Wire mesh cable tray fittings are field-fabricated from straight tray sections in accordance with manufacturer's instructions. Supports shall include the FAS (Fast Assembly System) where possible so that screws, bolts, and additional tools are not required for cable tray mounting to reduce installation time; and tray path can adapt to installation obstacles without the need for additional parts. Place supports so that support

span does not exceed that shown on the drawings and is capable of supporting total fill capacity loading.

a. Wire basket runway supports shall be of the trapeze hanger type.

b. Trapeze hangers shall be supported by 3/8-inch diameter rods.

c. Ceiling-mounted supports mount to ceiling structure directly or with threaded rod sized for total fill capacity.

    i. Cablofil AS Trapeze Hanging Clip suspended with 3/8” Threaded rods attached to structure.

        a. Structural attachments shall be made with appropriate clamps and support hardware.

        b. Contractor shall cut threaded rods no more than 1” maximum below the attachment nut under the tray support.

        c. Threaded rods are to be attached outside of the wire-basket and affixed to each side of the cable tray for proper support.

        d. Cable tray shall be supported at spacing of 4 to 5 feet for the Trapeze Hanging Clip.

        e. Support each end and middle of each section.

d. Wall Mount Support

    i. Wall shall be cable of support cable tray load and affixed to structural members. Where structural members are not available, the wall shall be supported to carry the load of the cable tray

        a. i.e. CMU Wall type

e. Splices, including those approved for electrical continuity (bonding), as recommended by cable tray manufacturer.

    i. Straight section splices shall be made using splice plates.

    ii. Splices shall be Cablofil EDRN Fast splice.

        a. Supply a total of (3) per splice

f. T-sections of tray shall be made using T-section fittings.

    i. Tee bends, and 90-degree turns shall be manufacturer premade fitting.

        a. Cablofil RADT90 Kit.

g. Vertical Transitions: As required, the cable tray may be field modified to accommodate ceiling conditions and elevation changes.

    i. Contractor shall follow manufacturer best practices and installation instructions.

    ii. Cut wires in accordance with the manufacturer instructions with the appropriate tool(s). Cut each wire with a clean-cut tool to eliminate the need for grinding and touchup of the galvanic protective layer.

h. Cable Drop Out/Waterfall

    i. Where cables bundles transition from tray to tray or tray to conduit or sleeve of varying elevations, the Contractor shall provide and install a radius control device. This device shall be a waterfall or drop out device and shall be properly sized to accommodate cable bundle plus 20% future growth.

ii. Contractor shall provide:

a. Cablofil CABLEXIT

i. Grounding: Cable tray grounding shall follow the manufacture best practices.

i. Contractor shall coordinate grounding and bonding of all cable trays.

ii. Contractor shall provide and install grounding lugs affixed to the cable

iii. tray system with a minimum #6 AWG installed along the cable tray and at ends of run. Cable tray shall be bonded to building steel every 50'-6-' and to the MDF/IDF grounding bus bar.

a. Cablofil GNDCL

N. Cable Tray systems shall include, but are not limited to, straight sections, supports, and accessories.

1. Legrand Cablofil CF 105 EZ Series

2.03 CABLE HOOK SYSTEMS

A. In the areas where the cables are required to be run in a "free-air" plenum, a cable hook system shall be used.

B. Cable hooks shall be capable of supporting a minimum of 30 lbs. with a safety factor of 3.

C. Spring steel cable hooks shall be capable of supporting a minimum of 100 lbs. with a safety factor of 3 where extra strength is required.

D. Cable hooks shall be Category 6a or better rated.

E. Follow manufacturer's recommendations for allowable fill capacity for each size of cable hook.

F. Installation and configuration shall conform to the requirements of the ANSI/ EIA/TIA Standards 568A & 569, NFPA 70 (National Electrical Code), and applicable local codes.

G. Cable hooks shall:

1. Have a flat bottom and provide a minimum of 1 5/8" cable bearing surface.

2. Have 90-degree radiused edges to prevent damage while installing cables.

3. Be designed so the mounting hardware is recessed to prevent cable damage.

4. Have a steel cable latch retainer to provide containment of cables within the hook.

5. Have a retainer that shall be removable and reusable.

6. Be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, and floor posts, to meet job conditions.

H. Factory assembled multi-tiered cable hooks shall be used where required to provide separate cabling compartments, or where additional capacity is needed.

I. Provide:

1. Panduit

2. Or approved equal.

2.04 SURFACE RACEWAY

A. In areas where surface raceway will be used as a cable path, no exposed cable shall be permitted.

B. With the agreement of the Consultant and Owner, where telecommunications outlets are to be located in areas where the walls cannot be fished, the station wire serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, laboratories, conference rooms, or like facilities. Contractor shall attempt to fish hollow walls, use existing conduit, or exhaust all other options to conceal cabling prior to installing surface raceway.

C. The raceway shall originate from a surface mounted box located off the floor, be attached to the wall, and terminate above the ceiling. The outlet box height shall match existing electrical receptacle height. Raceway for wall-mounted phone locations shall originate from a surface mounted box with the top of the box located 48" off the floor.

D. Raceway finish shall match finish of project electrical raceway. All fittings including but not limited to extension boxes, elbows, tees, and fixture boxes shall match the color of the raceway.

E. Telecommunication outlet faceplates shall match electrical faceplate standards for finish.

F. The raceway and all system devices shall be UL listed, exhibit nonflammable self-extinguishing characteristics, tested to specifications of UL94V-0, and be Category Compliant as defined by TIA/EIA 568.

G. Raceway turns or bends shall conform to manufacturer specifications or recommendations and industry best-practices for UTP and fiber optic cable minimum bend radius.

H. Non-Metallic raceway systems:

1. Non-metallic surface raceway shall have an adhesive-applied base and have a hinged snap-on cover. The raceway shall be manufactured of natural PVC compounds.

2. The raceway system shall be made up of the following components:

a. Raceway channel shall be Hubbell Premise Track.

b. Surface mount outlet boxes shall be Hubbell PDB12D.

c. Dropped ceiling connectors shall be Hubbell PDB12D.

d. Right angle fittings shall be Hubbell PP1FEBC or PL1FEBC.

e. Coupler fittings shall be Hubbell PP1SC or PL1SC.

I. All raceway systems shall be installed complete as specified herein and in manufacturer recommendations.

2.05 RE- ENTERABLE FIRESTOP CABLE PATHWAY SLEEVES

A. Fire rated cable pathway devices shall be used in fire-rated construction for ALL- low voltage, video, data, and voice cabling, optical fiber raceways, and certain high-voltage cabling where frequent cable moves, adds, and changes may occur. Pathways required for high-voltage cabling will be detailed on the prints. Such devices shall:

1. Meet hourly fire-rating of fire rated wall and pr floor penetrated.

2. Be tested for the surrounding construction and cable types involved.

3. Have UL Systems permitting cable loads from; “Zero to 100% Visual Fill.” This requirement eliminates need for fill-ratio calculations to be made by cable technicians to ensure cable load is within maximum allowed by UL System.
4. Be “Maintenance-Free”, having a corresponding Evaluation Services Report from a Notionally Recognized Third-Party Laboratory. Maintenance-Free is defined as; No action required by cabling technician to open and/ or close pathway for cable moves, adds or changes, such as, but not limited to:
    a. Opening or closing doors.
    b. Spinning rings to open or close fabric liner.
5. Removal and or replacement of any material such as, but not limited to , firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
6. Evaluation Services Report (ESR) from an accredited Nationally Recognized Third-party Laboratory certifying compliance with this definition of “Maintenance-Free” and all relevant codes and standards.
7. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
8. Pathways shall be engineered to be re-enterable, so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
9. Affix adhesive wall label immediately adjacent ot deices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

B. Non-rated cable pathway devices shall be used in non-fire rated construction for all low-voltage, video, data, and voice cabling, optical fiber raceways, and certain high-voltage cabling where frequent cables movs, adds, and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:
    1. Limit the movement of smoke and sound of wall and or floor penetrated.
    2. Restore the STC Rating of the penetrated assembly.
    3. Provide L Rating of greater than 1 CFM when empty and greater than 2.5 CFM at all other loading up to 100 percent.
    4. Accommodate cable loads from; “Zero to 100% Visual Fill.”
    5. Not have inner fabric liner that tightens around and compresses cables tightly together, encouraging penitential cable damage or interference.
    6. Be “Maintenance -Free,” maintenance-free is defined as; no action required by cabling technician to open and/ or close pathway for cable moves, adds, or changes, such as, but not limited to:
        a. Opening or closing doors.
        b. Spinning rings to open or close fabric liner.
        c. Removal and or replacement of any material such as, but not limited to , firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.

d. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.

e. Pathways shall be engineered to be re-enterable, so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.

f. Affix adhesive wall label immediately adjacent ot deices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

C. As an alternate to using a fire-rated or no rated cable pathway device for a single or tow low voltage cables (up to an aggregate cross-sectional area of 0.52 in. (14mm) O.D.) penetrating on or two-hour, gypsum board/stud wall assemblies or non-rated assemblies, either as a through-penetration or a membrane-penetration, a fire-rated cable grommet may be substituted. The product shall consist of a molded, two-piece, plenum-rated grommet having a foam fire and smoke sealing membrane that conforms to the outside diameter of the individual cable. The grommet product shall be capable of locking into place to secure the cable penetration within the wall assembly. The grommet shall be UL Classified and tested to the requirements of ASTM E814 (UL 1479) and CAN/ULC S115.

D. Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that, upon curing, do no re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exprosure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction. Provide letter from manufacturer certifying compliance with this section.

E. Cable pathway shall replace conduit sleeves in walls and floors, and the following:

1. When installed individually in floors, devices shall pass through core- drilled or preformed opening utilizing tested floor plates.

2. When multiple units are ganged in floors, devices shall be anchored by means of a tested grid.

3. When installed individually in walls, devices shall be pass through core drilled opening utilizing tested wall plates or integrated flanges.

4. When multiples units are ganged in walls, devices shall be anchored by means of tested adjustable gang bracket.

F. Cable tray shall terminate at each barrier and resume on the other side such that cables pass independently through devices. Cable tray shall be properly supported on each side of the barrier.

G. Manufacturer:

1. STI EZ Path Series 44

2.06 METAL CONDUITS AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Comply with TIA-569-B.

3. GRC: Comply with ANSI C80.1 and UL 6.

4. EMT: Comply with ANSI C80.3 and UL 797.

5. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
    a. Fittings for EMT:
        i. Material: Steel
        ii. Type: Setscrew
6. Expansion Fittings: Steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.07 OUTLET BOXES

A. General Requirements for Outlet Boxes

1. Comply with TIA-569-B.

B. Metallic outlet boxes and device covers shall be galvanized steel not less than 1/16" thick.

C. The dimensions of the metallic outlet box shall be 2"x4", 5"x5" and 6"x4" with a minimum depth of 3.5". (Finished depth shall be at least 3” deep for proper cable routing and bend radius). See drawings for details.

D. Metallic outlet boxes shall be equipped with single device cover (or two-device cover where needed).

E. Where installed in plaster, gypsum board, etc., covers shall be raised to compensate the thickness of the wall.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Where metallic outlet boxes are to be empty for future use, blank covers shall be used.

H. Gangable boxes are not allowed.

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.04 WIRE BASKET TRAY RUNWAY

A. Basket tray shall be installed in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of NEC, applicable portions of NFPA 70B and NECA’s “Standards of Installation” pertaining to general electrical installation practices.

B. Coordinate installation of wire basket runway with other electrical work as necessary to properly interface installation of wire basket runway with other work.

C. Provide sufficient space encompassing wire basket runways to permit access for installing and maintaining cables.

D. Test wire basket runways to ensure electrical continuity of bonding and grounding connections and to demonstrate compliance with specified maximum grounding resistance.

3.05 CABLE HOOK SYSTEM

A. J-hooks fabricated to contain data/voice and video cables may be used to support 25 or fewer cables in each hook. J-hooks are to be fastened to building steel with beam clamps, suspended from ceiling slab with threaded rod, or anchored to the wall. All J-hooks shall be hung straight and level. No other installation technique will be authorized unless pre-approved.

B. Three tiered double-sided J-hook configurations shall contain a maximum of 25 cables per hook or 150 cables. Smaller configurations may be used as bundles decrease in size, maintaining no more than 25 cables per hook.

C. Bundles surpassing 150 cables shall be supported by hangers, fabricated of 3/8” threaded rod and 24” Unistrut. Hangers shall also be installed where the installation of a three-tiered J-hook system is not appropriate for the ceiling space, or where blocked by other trades’ work.

D. Cable bundles consisting of fewer than 10 cables may be supported by single J hooks.

E. All cable support in the main cable path shall be installed every four feet. Small cable bundles (under 25) not in the main path may be supported every five feet.

F. Support wires and associated fittings that provide secure support and are installed in addition to the ceiling grid support wires shall be permitted as the sole support. Where independent support wires are used they shall be secured at both ends.

G. A sag shall be maintained between supports of 6”, to reduce cable strain. Velcro is an appropriate method of securing cables, when properly used and not over tightened.

H. Cable fill shall not exceed 40% fill ratio.

I. Proper cable support is extremely important to the Owner, and care shall be taken by the Contractor to provide and install the appropriate supports. Supports found to be inadequate will be replaced.

J. Cable bundles including voice/data cabling shall not have plastic cable ties.

K. All cable trunks shall have radius controlled cable waterfalls where trunk drops from conduit, sleeve or tray from horizontal path to vertical path.

3.06 SURFACE RACEWAY SYSTEM

A. In areas where surface raceway will be used as a cable path, no exposed cable shall be permitted.

B. With the agreement of the Consultant and Owner, if a telecommunications outlet is required in an area where the walls cannot be fished, the station cable serving these outlets shall be covered with raceway. No exposed cable shall be permitted within offices, laboratories, and conference rooms, or like facilities. Contractor shall attempt to fish hollow walls, use existing conduit, or exhaust all other options to conceal cabling prior to installing surface raceway.

C. The raceway shall originate from a surface mounted box located off the floor and be attached to the wall and terminate above the ceiling. The outlet box height shall match existing

electrical receptacle height. Raceway for a wall-mounted location shall originate from a surface mounted box with the top of the box located 48" off the floor.

D. Minimum bend radius shall be adhered to for UTP and fiber optic cable.

E. Where raceway is to be installed on painted, smooth, finished surfaces, the Contractor shall clean surface prior to installing raceway.

F. Where non-metallic raceway is to be installed on non-smooth surfaces such as wallpaper, unpainted brick, concrete, etc., the Contractor shall use flat-head screws in addition to the adhesive backing to fasten channel to surfaces.

G. Where Contractor is required to install metallic raceway, the raceway base shall be installed using flat-head screws and following all manufacturer's recommendations.

H. Where new outlet locations are indicated on Project Drawings as having existing Wiremold™ type raceway, the Contractor shall remove existing raceway from wall and install new specified raceway to cover any damage or markings caused from removing existing raceway product.

I. All surface raceway shall be mounted level and plumb. Where the Owner considers raceway channels to be installed unsatisfactorily, the Contractor shall remove and replace necessary channels at no additional cost to the Owner.

J. Suitable insulating bushings and inserts shall be used at connections to outlets and corner fittings. Dropped ceiling end fittings shall be utilized where raceway channel connects to dropped accessible ceiling tile. In rooms with drywall ceilings, open ceilings, or non-accessible ceilings, the Contractor shall extend raceway to the nearest location, hallway, or corridor that has accessible ceiling cavity. All cables shall be concealed.

3.07 PATHWAY APPLICATIONS

A. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT

2. Concealed in Ceilings and Interior Walls and Partitions: EMT

B. Minimum Pathway Size for Data: 1-inch trade size. Cable fill shall not exceed a 40% fill ratio.

C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.

3.08 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches of enclosures to which attached.

H. All conduit penetrations shall comply with all applicable fire codes. All conduit penetrations in fire-rated walls or floors shall be sealed and fire proofed to at least the rating of the penetration area.

I. Conduits shall be routed in the most direct route, with the fewest number of bends.

J. There shall be no continuous conduit sections longer than 100 feet. For runs that total more than 100 feet, insert junction or pull boxes (or gutters if appropriate) so that no continuous run between pull boxes is greater than 100 feet.

K. There shall be no more than two 90-degree bends (180 degrees total) between conduit pull boxes.

L. Changes in direction shall be accomplished with sweeping bends observing minimum bend radius requirements above. Do not use pull boxes for direction changes unless specifically designated otherwise in the Drawings.

M. Stub-ups to Above Recessed Ceilings:

1. Use EMT for pathways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

O. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

R. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb. tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

3.09 OUTLET BOXES

A. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

B. Exact locations of the outlet boxes shall be coordinated with the electrical contractor and other trades.

C. The approximate locations of the outlets are indicated on the drawings. The exact locations shall be determined at the building. The right is reserved to change without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

D. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a rain tight connection between box and cover plate or supported equipment and box.

E. Horizontally separate boxes by a minimum of 12" mounted on opposite sides of walls so they are not in the same vertical channel.

F. Outlet boxes installed back to back in fire-rated walls shall be separated horizontally by a minimum of 24".

G. Install all outlet boxes in finished areas flush with the wall. Maintain ¼" or less space between outlet box front and finished wall surface.

H. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

I. Outlet boxes shall be firmly anchored in place and shall not depend on the cover plate to hold it secure to the wall.

J. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

K. Any surface boxes shall have rounded corners and edges. Surface boxes must be approved by Owner prior to installation.

3.10 RISER CONDUITS

A. Conduits entering equipment rooms shall be reamed or bushed and terminated not more than 4" from a wall and within 12” of room corners.

B. Conduits entering equipment rooms from below floor shall be terminated not more than 4" above finished floor.

C. Conduits shall not be less than 4" trade size and be equipped with a measured pull line at 12” increments rated at a minimum 1200-pound test.

D. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction.

E. Provide an insulating press fit bushing on all telecommunications riser conduits. Bushings must be rated to be used in an environmental air handling space (Plenum).

3.11 SLEEVE-SEAL INSTALLATION FOR COMMUNICATION PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.12 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

End of Section

SECTION 27 05 26

GROUNDING AND BONDING FOR TECHNOLOGY SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Speficiation Sections, apply to this Section.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

1.03 Related Work

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 23 – Pathways for Technology Systems

D. Section 27 05 37 – Firestopping for Technology Systems

E. Section 27 11 00 – Communications Equipment Rooms

F. Section 27 13 00 – Communications Backbone Cabling

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 18 00 – Communications Labeling and Identification

J. Section 27 40 00 – AV/Multimedia General Requirements

K. Section 27 41 00 – Audio Visual Systems

L. Section 27 51 00 – Distributed Communications Systems

M. Section 27 60 00 – Physical Security General Requirements

N. Section 27 64 00 – Video Surveillance System

O. Section 27 66 00 – Intrusion Detection System

P. Section 28 13 16 – Electronic Access Control System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCES STANDARDS AND CODES

A. IEEE C2 - National Electrical Safely Code

B. IEEE Std. 837-2002, or latest version – Standard for Qualifying Permanent Connections Used in Substation Grounding

C. ANSI/TIA-607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

D. NFPA 70E - Standard for Electrical Safely in the Workplace

E. ANSI/NECA/BICSI-607 - Telecommunications Bonding and Grounding Planning and Installation methods for Commercial Buildings

F. UL 467 - Standard for Grounding and Bonding Equipment

G. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 SUBMITALLS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 GROUNDING AND BONDING CABLE

A. The grounding and bonding cable shall be stranded copper conductors.

B. The grounding and bonding cables shall have a green jacket color and riser or plenum rated as required.

C. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications, or as required by NFPA 70, whichever is larger. Differentiate between normal ground and isolated ground when both are used within the same facility.

2.03 GROUNDING AND BONDING BUSBARS

A. Telecommunications Main Grounding Busbar (TMGB)

1. Factory-drilled solid copper with holes to accommodate lugs. Field manufactured busbars are not acceptable.

2. 0.25” thick x 4” wide

3. Sized for current applications and future growth, no less than 18”

4. Insulated from its support

5. Shall be an electro-tin plated busbar

6. Maintain a minimum of 2” of clearance from wall
7. UL listed and BICSI certified

B. Telecommunications Grounding Busbar (TGB)

1. Factory-drilled solid copper with holes to accommodate lugs. Field manufactured busbars are not acceptable.
2. 0.25” thick x 4” wide
3. Sized for current applications and future growth, no less than 12”
4. Insulated from its support
5. Shall be an electro-tin plated busbar
6. Maintain a minimum of 2” of clearance from wall
7. UL listed and BICSI certified

C. Horizontal Equipment Rack or Cabinet Busbar

1. Mounts to standard 19” Rack or Frame
2. Capacity: 6 Double hole lugs
3. Shall be an electro-tin plated busbar
4. UL listed and BICSI certified

D. Vertical Equipment Rack or Cabinet Busbar

1. Mounts to vertical rail or inside of cabinet in 19” or 23” equipment rack or frame.
2. Capacity: 9 Double hole lugs
3. Shall be an electro-tin plated busbar
4. UL listed and BICSI certified

2.04 MECHANICAL CONNECTORS

A. Mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers, and lock washers shall be made of Silicon Bronze and supplied as a part of the connector body and shall be of the two bolt type.

B. Split bolt connector types are not allowed.

C. Connectors shall meet or exceed UL 467.

2.05 COMPRESSION LUGS

A. Shall be UL & CSA listed

B. Shall meet or exceed the performance requirements of IEEE 837, latest revision

C. Compression type

D. Shall be manufactured from pure wrought copper. Conductivity of this material shall be no less than 99% by IACS standards.

E. Shall be electro-tin plated

F. Lugs shall be 2-hole. Single hole lugs are not allowed

G. Long barrel that will allow a minimum of two crimps with standard industry colors

H. Each connector shall be filled with an oxide-inhibiting compound

I. Crimped with a compression, tool and die system, according to manufacturer's recommendation

2.06 TAPS

A. Connections to the Conductor shall be made with irreversible compression connectors

B. Shall be UL & CSA listed

C. Requires a minimum of (2) crimps for C Tap or H Tap, 1 crimp for I-Beam and busbar Tap

D. Crimp according to manufacturer's recommendation

PART 3 - EXECUTION

3.01 GENERAL

A. Install products in accordance with manufacturer's recommendations.

B. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

C. Mechanical connections shall be accessible for inspection and maintenance.

D. No insulation shall be installed over mechanical ground connections.

E. Ground connection surfaces shall be cleaned and all connections shall be made so that disconnection or removal is impossible.

3.02 RESISTANCE MEASURMENT

A. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms.

3.03 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

A. The intended function of a TBB is to reduce or equalize potential differences between telecommunications systems. While the TBB will carry some current under ac power ground fault conditions, it is not intended to provide the only ground fault return path.

B. The TBB shall:

1. Be connected to the TMGB & TGB.

2. Be a continuous copper conductor that shall be sized no less than 6 AWG to a maximum of 3/0 AWG. The TBB shall be sized in accordance to the following table:

Linear Length – ft.	Size (AWG)
Less than 13	6
14 - 20	4

21 - 26	3
27 - 33	2
34 - 41	1
42 - 52	1/0
53 - 66	2/0
Greater than 67’	3/0

3. The TBB conductors shall be installed and protected from physical and mechanical damage.
4. The TBB conductors should be installed without splices.
    a. Where splices are necessary, the number of splices should be kept to a minimum and they shall be accessible and located within telecommunications spaces or j-box labeled as a telecommunications bonding backbone splice.
    b. Joined segments of a TBB shall be connected using exothermic welding, irreversible compression-type connectors or equal.

C. A metallic cable shield shall not be used as a TBB.

3.04 GROUNDING EQUALIZER (GE)

A. The GE shall be a continuous copper conductor that shall be sized no less than 6 AWG to a maximum of 3/0 AWG. The GE shall match the size of the TBB.

B. The GE shall connect to the telecommunications grounding busbar(s) in the same-floor telecommunications rooms on the first, top, and every third floor in a building greater than 4 floors.

C. A metallic cable shield shall not be used as a GE.

3.05 TELECOMMUNICATIONS EQUIPMENT BONDING CONDUCTOR (TEBC)

A. Connects the TMGB/TGB to equipment racks and cabinets.

B. Shall be a continuous copper conductor that shall be sized per the length of cable.

C. Shall be separated from ferrous materials by 2” or be bonded to the ferrous metal.

D. May be routed within cable trays or suspended 2” under or off the side of the cable tray or ladder rack.

E. Shall be supported every 3ft.

F. 8” minimum bend radius.

G. May come cross other cable groups at a 90 degree angle only.

H. A metallic cable shield shall not be used as a TEBC.

3.06 RACK OR CABINET BONDING CONDUCTOR

A. A bonding conductor shall be used to connect the equipment racks and cabinets directly to the TMGB, TGB or underfloor ground mesh network.

B. All metallic enclosures, including remote mounted equipment cabinets and racks for telecommunications, security or audio/visual shall be bonded to the nearest TMGB or TGB using a minimum sized conductor of 6 AWG. Remote bonds shall be labeled on both ends stating the destination of the bond.

3.07 ELECTRICAL DISTRIBUTION PANEL (EDP)

A. The AC EDP serving the Telecommunications Room shall be bonded to the TMGB or TGB using a minimum of a 6 AWG cable.

B. A qualified electrician shall make all connections within an AC electrical distribution panel.

3.08 OPTICAL FIBER CONDUCTIVE CABLES

A. Conductive fiber-optic cables should be bonded and grounded as specified in the NEC.

3.09 CONDUIT AND SLEEVE BONDING

A. All conduits and sleeves entering a telecommunications room shall be grounded.

3.10 LADDER RACK AND / OR CABLE TRAY

A. All low voltage cable runway sections shall be bonded together and bonded back to the nearest Telecommunications Room the runway is serving as close TMGB or TGB as practical.

B. Maintain an 8” minimum bend radius on the TEBC.

C. Keep a 2” separation from other cables both power and telecommunications.

D. Remove any paint, oxidation, etc. from the runway surfaces that are being bonded.

E. Drill two holes as required to accommodate the 2-hole compression lug.

F. Apply a thin coat of antioxidant around the holes and on the surface where the lug will be in contact.

G. Attach straps to the runway using stainless steel hardware sized for the lug holes.

H. Wipe off any excess antioxidant after installation of the lug.

3.11 BUILDING STEEL

A. Each ground bus bar shall be bonded to building steel.

B. Remove any paint or fire stopping spray from the building steel.

C. Provide the appropriate bonding connector to connect to beams, trusses or other types of structure.

3.12 LABELING

A. Each grounding/bonding cable shall be labeled at the TMGB or TGB.

B. All taps to the TBB shall be within an enclosure and labeled as to its purpose.

C. Mechanical connectors shall be clearly marked with the catalog number, conductor size, and manufacturer.

D. Compression lugs shall be clearly marked with manufacturer, catalog number, conductor size, and required compression tool settings.

3.13 TESTING

A. Refer to Section 27 00 00 for additional requirements.

B. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

3.14 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

End of Section

SECTION 27 05 37

FIRESTOPPING FOR TECHNOLOGY SYSTEMS

PART 1 - GENERAL

1.01 SCOPE

A. All penetrations of walls shall be approved by the General Contractor before any penetrations are made. Should the Contractor find it necessary to penetrate any walls extending to the slab, it will be the responsibility of that Contractor to provide satisfactory sleeving and fire caulking both inside and outside of that sleeving. If existing sleeving is to be utilized, it will be the responsibility of the Contractor to fire caulk inside the sleeving.

B. Refer to Section 27 00 00 for additional project scope information.

1.02 RELATED WORK

A. Division 7 - Firestopping

B. Section 27 00 00 – General Technology Requirements

C. Section 27 05 00 – Communications General Requirements

D. Section 27 05 26 – Grounding and Bonding for Technology Systems

E. Section 27 05 28 – Pathways for Technology Systems

F. Section 27 05 37 – Firestopping for Technology Systems

G. Section 27 11 00 – Communications Equipment Rooms

H. Section 27 13 00 – Communications Backbone Cabling

I. Section 27 15 00 – Communications Horizontal Cabling

J. Section 27 16 00 – Communications Connecting Cords

K. Section 27 18 00 – Communications Labeling and Identification

L. Section 27 40 00 – AV/Multimedia General Requirements

M. Section 27 41 00 – Audio Visual Systems

N. Section 27 51 00 – Distributed Communications Systems

O. Section 27 60 00 – Physical Security General Requirements

P. Section 27 64 00 – Video Surveillance System

Q. Section 27 66 00 – Intrusion Detection System

R. Section 28 13 16 – Electronic Access Control System

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.04 REFERENCE STANDARDS AND CODES

A. ANSI/TIA-1179-A “Healthcare Facility Telecommunications Infrastructure”.

B. ANSI/TIA-EIA-569-D “Telecommunications Pathways and Spaces”

C. ASTM E90, “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”.

D. ASTM E814, “Fire Tests of Through Penetration Firestops”.

E. ASTM E1725, “Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components”.

F. CAN/ULC S115, "Standard Method of Fire Tests of Firestops Systems."

G. UL 1479, “Fire Tests of Through Penetration Firestops”.

H. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.

I. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.

J. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

K. Refer to Section 27 00 00 for additional requirements.

1.05 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.06 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.07 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 General Performance Requirements

A. Fire rated cable pathway devices shall be used in fire-rated construction for all low-voltage or optical fiber raceways. Such devices shall:

1. Meet the hourly fire-rating of fire rated wall and or floor penetrated.

2. Be tested for the surrounding construction and cable types involved.

3. Re-enterable firestop pathway shall have UL Systems permitting cable loads from zero to 100% visual fill.

4. Re-enterable firestop pathway shall be maintenance-free as defined by not requiring the removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.

5. Pathways shall be engineered such that two or more devices may be ganged together for additional cable capacities.

6. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

7. Size as shown on the drawings or as required when not specifically identified.

B. Non-rated cable pathway devices shall be used in non-fire-rated construction such as smoke partitions for all low-voltage and fiber optic cabling where frequent cable moves, adds and changes may occur. Such devices shall:

1. Limit the movement of smoke and sound of wall and or floor penetrated.

2. Restore the STC Rating of the penetrated assembly.

3. Provide L Ratings of greater than 1 CFM when empty and greater than 2.5 CFM at all other loading up to 100 percent.

4. Accommodate cable loads from zero to 100% visual fill.

5. Be maintenance-free as defined by not requiring the removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.

6. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.

7. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.

8. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

C. Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

D. Cable tray shall terminate at each barrier and resume on the other side such that cables pass independently through devices. Cable tray shall be properly supported on each side of the barrier.

E. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.03 MATERIALS

A. General: Use only products that have been tested for specific fire resistance rated construction conditions or acoustical and smoke related requirements conforming to construction assembly type, penetrating item type, annular space requirements, and rating involved for each separate instance.

B. Firestop Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal Series SSS or LCI Sealant.

2. Hilti

C. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal Series SSP Putty.

2. Hilti

D. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag, the following products are acceptable:

1. Specified Technologies Inc. (STI) SpecSeal Series SSB Pillows.

2. Hilti

E. Fire-Rated Cable Grommet: Molded, two-piece grommet with an integral fire and smoke sealing foam membrane for sealing individual cable penetrations through framed wall assemblies.

1. Specified Technologies Inc. (STI) EZ-Firestop Grommets.

2. Hilti

F. Fire-Rated Cable Re-Enterable Pathways: Device modules comprised of steel pathway with self-adjusting intumescent foam pads or fabric ring allowing 0 to 100 percent cable fill, the following products are acceptable:

1. Specified Technologies Inc. (STI) EZ-PATH Fire Rated Pathway.

2. Hilti Speed Sleeve

G. Smoke and Acoustical Pathways: Device module comprised of a nonmetallic pathway with integral self-adjusting smoke and sound sealing system for cable penetrations through non-fire-resistance rated wall or floor assemblies, the following products are acceptable:

1. Specified Technologies Inc. (STI) EZ-PATH Smoke & Acoustical Pathway.

2. Hilti

H. Protective Wrap: Endothermic Wrap incorporating foil scrim for protection of cable pathways, through-penetration and membrane-penetration firestopping, Electrical Metallic Tubing (EMT), Rigid Metallic Conduit (RMC), or Cable Trays. The following products are acceptable:

1. Specified Technologies, Inc. (STI) E-Wrap™ Endothermic Wrap

2. Hilti

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.04 INSTALLATION

A. Install systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified or required.

B. Comply with manufacturer's instructions for installation of products.

C. Place system stickers on each side of wall penetrations.

D. Place a reproduction (photo copy) of the UL System description in a document protector and mount to the wall next to the wall penetration. Highlight the section of the system description that list the allowed cable types.

E. Do not install products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

F. Do not install products when substrates are wet due to rain, frost, condensation, or other causes.

G. Do not use materials that contain flammable solvents.

H. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to requirements.

I. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

3.05 SCHEDULES

Penetrant Type	Concrete Floor	Concrete Wall	Gypsum Board Wall
Blank Opening	C-AJ-0100, C-AJ-0101, C-AJ-0113, C-AJ-0116	C-AJ-0100, C-AJ-0101, C-AJ-0113, C-AJ-0116	W-L-0020, W-L-0034
Metal Conduits	C-AJ-1080, C-AJ-1240, C-AJ-1353	C-AJ-1080, W-J-1098, W-J-1100	W-L-1049, W-L-1222, W-L-1168
Plastic Conduits and Raceways	C-AJ-2140, C-AJ-2292, F-A-2186, F-A-2210, F-A-2225	C-AJ-2038, C-AJ-2108, C-AJ-2578, C-AJ-2586, W-J-2018, W-J-2076	W-L-2059, W-L-2074, W-L-2093, W-L-2241
Cables	C-AJ-3214, C-AJ-3231, F-A-3015, F-A-3021, F-A-3054	C-AJ-3214, C-AJ-3231, W-J-3098, W-J-3099,W-J-	W-L-3219, W-L-3248, W-L-3287, W-L-3356, W-L-3377, W-L-3378,

		3124, W-J-3150, W-J-3180	W-L-3379, W-L-3390
Cable Trays	C-AJ-3317, C-AJ-8181, C-AJ-4029, F-A-3015, F-A-3037	C-AJ-8181, W-J-4021, W-J-4022, W-J-4033, W-J-3098, W-J-3145, W-J-3158	W-L-3218, W-L-3271, W-L-3286, W-L-3306, W-L-4008, W-L-4029, W-L-4043, W-L-8073

End of Section

SECTION 27 11 00

COMMUNICATIONS EQUIPMENT ROOMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Section, apply to this Section.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. This section describes the products and execution requirements relating to telecommunications cabling, termination components, racks, pathways, telecommunication rooms and related subsystems. Covered systems include the following:

1. Equipment room cable management system and equipment racks
2. Horizontal and backbone cable terminating equipment.
3. Telecommunications grounds and related components

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 05 28 – Pathways for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 11 00 – Communications Equipment Rooms

G. Section 27 13 00 – Communications Backbone Cabling

H. Section 27 15 00 – Communications Horizontal Cabling

I. Section 27 16 00 – Communications Connecting Cords

J. Section 27 18 00 – Communications Labeling and Identification

K. Section 27 51 00 – Distributed Communications Systems

L. Section 27 60 00 – Physical Security General Requirements

M. Section 27 64 00 – Video Surveillance System

N. Section 27 66 00 – Intrusion Detection System

O. Section 28 13 16 – Electronic Access Control System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCES STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 SUBMITALLS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 CATEGORY 6A PATCH PANELS

A. Cables shall be terminated at the telecommunication closets on high-density integrated patch panels incorporating Category 6 jacks (non-keyed 8-pin), meeting the specifications for the telecommunications outlet detailed in the section above.

B. Patch panel configuration shall be 48 ports.

C. The patch panel shall exceed ANSI/TIA/EIA 568-C.2-1 Category 6A component compliance standard. All pair combinations shall be considered, with the worst-case measurement being the basis for compliance.

D. The patch panels shall be interoperable and backwards compatible to lower performing cabling systems.

E. Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to ensure that all manufacturers' minimum bend radius specifications are adhered to.

F. The patch panel shall have color-coded designation strips to identify cable count.

G. Manufacturers:

1. Uniprise CPPA-UDDM-M2U-48 (760207308) 48-port modular flat panel -2U-angled.

2.03 FIBER OPTIC PATCH PANELS

A. The Contractor shall provide a fiber optic patch panel at each location where a fiber optic cable terminates.

B. All terminated fibers shall be mated to duplex LC couplings mounted on enclosed patch panels. Couplers shall be mounted on a panel that, in turn, snaps into the enclosure. The

proposed enclosure shall be designed to accommodate a changing variety of connector types, including SC, ST, Fixed Shroud Duplex (e.g., “FDDI Connector”), Biconic, and FC by changing panels on which connector couplings are mounted.

C. The patch panel enclosure shall be sized to accommodate the total fiber count to be installed at each location as defined in the specifications and Drawings, including those not terminated (if applicable), PLUS 50% future growth.

D. The Contractor shall provide all required connector panels and connector couplings (sleeves, bulkheads, etc.) adequate to accommodate the number of fibers to be terminated.

E. Patch panels shall be designed for easy installation, front removal, and expansion of snap-in adapter panels.

F. Patch panels shall be enclosed assemblies affording protection to the cable subassemblies and to the terminated ends. The enclosures shall incorporate a hinged or retractable front cover designed to protect the connector couplings and fiber optic jumpers.

G. The patch panel’s enclosure shall provide for strain relief of incoming cables and shall incorporate radius control mechanisms to limit bending of the fiber to the manufacturer’s recommended minimums or 1.2”, whichever is larger.

H. Access to the inside of the patch panel enclosure during installation shall be from the front and rear. Panels that require any disassembly of the cabinet to gain entry will not be accepted.

I. All patch panels shall provide protection to both the “facilities” and “user” side of the coupling. The patch panel enclosure shall be configured to require front access only when patching. The incoming cables (backbone, riser, etc.) shall not be accessible from the patching area of the panel. The enclosure shall provide a physical barrier to access of such cables.

J. Where singlemode fibers are installed, the fibers contained in these cables may be terminated either by (1) splicing of factory-terminated cable assemblies (“pigtails”) or (2) use of a “fan-out” kit. In the latter approach, individual fibers are to be secured in a protective covering (such as an Aramid reinforced tube, for example) with connectors mated to the resulting assembly. In both instances, the proposed termination hardware shall incorporate a mechanism by which cable and subassemblies are secured to prevent damage. Splicing shall be by the “fusion” method. Individual splice loss shall not exceed 0.2 dB.

K. Fiber optic patch panels shall be:

1. CommScope EPX-2U-PNL-ENC (760251045) 2U Sliding Adapter Panel Shelf in TR/IDF
2. CommScope EPX-4U-PNL-ENC (760251049) 4U Sliding Adapter Panel Shelf in MDF or Server Rooms (Highly Density)
3. Or approved equal.

L. 50-micron LC adaptor panels shall be:

1. CommScope OM4 splicing cassette with pigtails LGX/100-Splice-Cassette.

M. Singlemode LC adaptor panels shall be:

1. CommScope splicing cassette with pigtails LGX/100 Splice-Cassette.

2.04 CABLE MANAGEMENT SYSTEM

A. The cable management system shall be used to provide a neat and efficient means for routing and protecting fiber and copper cables and patch cords on telecommunication racks and enclosures. The system shall be a complete cable management system comprising 4-post and 2-post floor mount racks, wall mount racks, equipment cabinets and vertical and horizontal cable managers to manage cables on both the front and rear of the rack. The system shall protect network investment by maintaining system performance, controlling cable bend radius, and providing cable strain relief.

1. 2 – Post Equipment Racks

    a. The Contractor shall provide and install 2 post adjustable equipment racks to house cable termination components (e.g., copper data and fiber optic) and network electronics (by others) as shown on the Drawings. Prior to installation, the Contractor shall coordinate exact placement with Consultant and Owner.

    b. 45U – 7ft (2134 mm) H x 6in (152mm) Channel x 19in (428.6mm) Equipment Rack

    c. Rack is to provide 45 rack-mount spaces in a “7-foot rack” for equipment. Each mounting space will be marked and numbered on the mounting channel.

    d. For the “7-foot rack” the assembled rack will measure 84’ (2133.6 mm) high, 20.4 (518 mm) wide, and 15” (381 mm) deep. The sides (webs) of the equipment-mounting channels will be punched to allow attachment of vertical cable managers along the sides of rack or for rack-to-rack baying.

    e. Finish shall epoxy-polyester hybrid powder coat in the color as specified below.

    f. Channel uprights shall be spaced to accommodate industry standard 19" mounting and have pass-through holes with smooth edges to protect cables.

    g. Rack shall be constructed of aluminum.

    h. Able to support up to 1,500 pounds.

    i. Rack shall be double side drilled and tapped to accept 12-24 screws. Uprights shall also be drilled on back to accept cable brackets, clamps, power strip(s), etc. Hole pattern on rack front shall be per EIA/TIA specifications (5/8"-5/8"-1/2"). Hole pattern on the rear shall be at 3" intervals to accept cable brackets.

    j. Rack shall be supplied with at least 24 spare screws.

    k. Rack shall be supplied with a vertical ground bar and #6 AWG ground lug.

    l. Approved Manufacturer :

        i. CommScope RK6 – 45A (760082495), Black

2. Vertical Cable Management

    a. At the telecommunication rooms, vertical cable management shall be furnished and installed to adjacent racks to organize cables on front and rear of telecommunication racks.

    b. Vertical cable managers shall include components that aid in routing, managing, and organizing cable to and from equipment. Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief. Panels shall be a universal design mounting to EIA 19" or 23" racks.

c. The door(s) shall be designed to provide a concealed vertical space for organizing patch cables.

d. Cable spools shall be used to organize longer patch cable lengths.

e. Vertical cable management at the end of rack rows shall be 6”.

f. Vertical cable management between racks shall be 12”

g. Approved Manufacturer:

i. CommScope VCM-DS-84-6B (760244779) 6’ Double Side, Vertical Cable Management, Black Door

ii. CommScope VCM-DS-84-12B (760244782) 12” Double Side, Vertical Cable Management, Black Door

B. Horizontal Cable Management

1. Horizontal cable managers shall include components that aid in routing, managing, and organizing cable to and from equipment. Panels shall protect network equipment by controlling cable bend radius and providing cable strain relief. Panels shall be a universal design mounting to EIA 19" racks and constructed of steel bases with PVC duct attached. The duct fingers shall include retaining tabs to retain the cables in place during cover removal. The covers shall be able to hinge from either side yet still be easily removed to allow for quick moves, adds, and changes.

2. The cable managers shall be provided with movable wire retainers to retain the cables during cover removal and #12-24 mounting screws. An integral strain relief bracket shall be provided on either end of the duct to allow for easy cover placement.

3. The horizontal cable management kits are installed on a 19-inch (483mm) wide industry standard rack above or below panels to organize patch cables.

4. The kits shall be available in a single-sided configuration and in a 2U- and 3-U height.

5. The units shall include covers that can be opened from the top, the bottom, or removed all together.

6. The cover hinges shall be designed to hold the cover open from the top or bottom to facilitate faster cabling.

7. The 2U and 3U cable managers shall have a pass-through feature allowing access to and from the rear for additional cable routing.

8. The depth of the units shall be:

a. Single-sided: 5-1/2 inches (140 mm) deep from front to back with the cover closed.

9. Approved Manufacturer:

a. CommScope HTK-19-SS-3U (760072967) 3RU Horizontal Cable Management

b. CommScope HTK-19-SS-2U (760072959) 2RU Horizontal Cable Management

2.05 SHALLOW WALL MOUNT CABINET

A. Where Indicated on Project Drawings, the Contractor shall provide and install a shallow wall mount cabinet to house cable termination panels and network electronics. The Contractor shall also provide and install ¾" plywood backboard for support when mounting cabinet.

B. The Contractor shall coordinate with General Contractor to install power outlet into cabinet.

C. Cabinets housing active equipment shall be equipped with a fan and fan controller.

D. Manufacturers:

1. Hubbell RE4X
2. Panduit
3. Or approved equal

2.06 WALL MOUNT EQUIPMENT CABINET

A. Where indicated on Project Drawings, the Contractor shall provide and install wall mount cabinet to house cable termination panels and network electronics. The Contractor shall also provide and install one (1) ¾" plywood backboard for support when mounting cabinet.

B. The Contractor shall coordinate with Electrical Contractor to install a power outlet into cabinet.

C. Cabinets shall be equipped with fans and thermostatic fan controller.

D. Manufacturers:

1. Cabinet shall be Hoffman Access Bus with Gland Plate.
2. Part #EWMWG482825

2.07 TELECOMMUNICATION GROUND

A. The Telecommunication Contractor is responsible for providing an appropriate ground for all racks, trays, and telecommunications equipment installed by this Contractor. Refer to the Grounding and Bonding for Technology Systems specification section.

2.08 WIRE BASKET RUNWAY TRAY

A. Within each Telecommunications Room, the Contractor shall provide and install sufficient wire basket tray to support cable bundles from corridor to equipment racks or as shown on the Project Drawings, this Contractor shall provide and install sufficient basket tray to support cable bundles from corridor to equipment racks or cabinets.

B. The Contractor shall provide all necessary labor, supervision, materials, equipment, tests, and services to install complete wire basket runway systems in the telecommunication closet.

C. Wire basket runway systems shall include, but are not limited to, straight sections of continuous wire mesh, field formed horizontal and vertical bends, tees, drop outs, supports, and accessories.

D. Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

E. Reference 27 05 23 for additional information.

2.09 LADDER RACK

A. Within each Telecommunications Room, the Contractor shall provide and install ladder rack as shown on the Project Drawings.

B. Within each Telecommunications Room with a vertical conduit riser the Contractor shall provide and install vertical ladder rack connecting the ground conduit sleeve penetrations with the ceiling conduit sleeve penetrations.

C. Ladder rack/tray shall be manufactured from tubular steel. Stringers (sides) will be made from 3/8’ wide by 1-1/2’ high tubular steel with .065’ wall thickness. Cross members (rungs) will be made from 1’’ wide by ½’’ high tubular steel with .065’’ wall thickness.

D. Ladder rack/tray cross members will be welded in between stringers on 9’ centers. There will be 8’ of open space in a complete ladder rack system in the telecommunication room as shown on the Drawings.

E. Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

F. All splicing assemblies shall be the bolted type using serrated flange locknuts. Hardware shall be either yellow zinc dichromate in accordance with ASTM B633 SC2 or AISI Type 304 stainless steel.

G. Cable Drop Out/ Waterfall

1. Where cables bundles transition from tray and drop into the rack/cabinets, the Contractor shall provide and install a radius control device. This device shall be a waterfall or drop out device and shall be properly sized to accommodate cable bundle plus 20% future growth.

H. Size ladder rack as indicated on the Contract Documents.

I. Accessories (connectors, splice plates….) shall be painted to match tray finish.

J. Approved Manufacturers:

1. CommScope CR-SLR-10L12W (760085647) 10ft long, 12” wide, Black
2. CommScope CR-SLR-10L18W (760085654) 10ft long, 18” wide, Black
3. Or approved equal.

K. Horizontal 90° Turns (Cable Runway E-Bend)

1. Horizontal 90° turns shall be manufactured from 3/8” wide by 1-1/2” high tubular steel with .065” wall thickness
2. Stringers (sides) will be formed in a 90° arc. Cross members will be welded in between stringers on approximate 23° increments so that there are 5 cross members per turn. The welded assembly will have an inside radius that will create a smooth horizontal 90° turn.
3. Approved Manufacturers:
    a. CommScope CR90FCB-12W (760085530) 12-inch (305 mm) W
    b. CommScope CR90FCB-18W (760085548) 18-inch (457 mm) W

L. Ladder Rack/Tray Splices

1. Splice kits will provide a method of mechanically connecting ladder rack/tray sections and turns together end-to-end or side-to-end to form a continuous pathway for cables.
2. Design Make:
    a. CommScope part numbers
        i. CRBSK (760083899) Butt Splice Kit
        ii. CRTJSK (760084046) Junction Splice Kit

M. Ladder Rack/Tray Accessories

1. Cable straps used for attaching cable bundles to the ladder rack/tray cross members must be reusable with a hook and loop-style closure, at least ¾" wide, and sized for cable bundles that are 2", 3", or 4" in diameter.

2. Cable retaining posts used to keep cable from falling off of the side of the ladder rack/tray shall be manufactured from 1" by ½" tubular steel with .065" wall thickness. Cable retaining posts will be 8" high and will attach to the side stringer of the ladder rack/tray with included hardware. The top of the cable retaining posts will be fitted with a rubberized end cap to protect cables.

3. End caps used to cover the ends of ladder rack/tray will be manufactured from a black fire-retardant rubberized material. End caps will be sized for 3/8" wide by 1-1/2" high side stingers and will be sold in pairs.

4. Radius drops or "waterfalls" used to maintain the bend Radius of the cables as they exit or enter the ladder rack/tray will be manufactured from aluminum extrusion. The extrusion will be formed in a 90° arc with a minimum bend radius of 3". Radius drops will attach to either the side stringer or the cross member of the ladder rack/tray using a clevis pin. Radius drops will include 1-1/2" high cable spools that attach to the top of the radius drop to guide cables.

5. Auxiliary support brackets used to support cables that should be physically separated from the cables in the ladder rack/tray will be made from 1/8" x 1" steel bar. The bracket from the cables in the ladder rack/tray will be made from 1/8" x 1" steel bar. The bracket will be L-shaped and will attach to the side stringer of the ladder rack/tray. The bracket will hang below the ladder rack/tray a minimum of 4". The bracket support surface will be 4" long. The bracket will be zinc plated with a gold chem finish.

6. Unless otherwise noted, finish on all metal components shall be epoxy-polyester hybrid powder coat (paint) in the color(s) specified below. Hardware will be zinc plated with a gold chem. finish.

7. Approved manufacturers:

    a. CommScope CRRP-8H (760083980) Cable retaining posts

    b. CommScope CRPECK (760084012) Ladder rack end caps

    c. CommScope CRDK-12W (760083956) Radius Drops

    d. CommScope CRDK-18W (760083964) Radius flat corner

    e. CommScope CR90ICB-12W (760085688) Radius inside corner

    f. CommScope CR90ICB-18W (760085696) Radius inside corner

    g. CommScope CR6-12-WRSK (760084145) Wall angle support

    h. CommScope CR15-18-WRSK (760084152) Wall angle support

    i. CommScope CRR2RRMK (760084053) Rack mounting kit

    j. CommScope CRVWBK (760084137) Vertical wall bracket

    k. CommScope CRCMK3-8TR (760083907) Ceiling mounting kit

    l. CommScope CRTWSBK-12W (760084095) Wall support bracket

    m. CommScope CRTWSBK-18W (760084103) Wall support bracket

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.04 EQUIPMENT RACK AND CABINETS

A. Prior to permanently securing racks or cabinets, the Contractor shall coordinate a walk through with the Owner to determine exact placement of racks.

B. The Contractor shall bolt the rack to the floor as recommended by the manufacturer. Multiple racks shall be joined and the ground made common on each. Rack shall also be stabilized by extending a brace extending to the wall. Alternately, overhead cable tray over which the cabling accesses the equipment rack(s) shall provide this function.

C. A space between the rack upright and the wall (~6") shall be planned to allow for cabling in that area. The rear of the rack shall be ~40" from the wall to allow for access by maintenance personnel. In all cases, a minimum of 40" workspace in front of the rack is also required. Locations where these guidelines cannot be followed shall be brought to the attention of the Consultant for resolution prior to installation.

D. All hardware and equipment is to be mounted at least 18" above floor level. This is to afford easy access and, in the case of the lower limit, prevent damage to the components. Positioning of hardware shall be reviewed and approved by the Consultant and Site Coordinator(s) prior to installation.

E. Equipment rack shall be equipped with cable management hardware to allow an orderly and secure routing of twisted pair cabling to the data patch panels. At minimum, one such horizontal jumper management panel shall be placed below each fiber optic patch panel installed by the Contractor. Additional jumper management panels may be required pending installation of other cable types on the rack. The rack shall be grounded to the telecommunications grounding backbone (TGB) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket).

3.05 WIRE BASKET TRAY AND LADDER RACK RUNWAY

A. Provide all components of the ladder rack/tray system (ladder rack/tray, turns, splices, supports, and accessories) from a single manufacturer.

B. B. Ladder rack/tray shall be installed with side stringers facing down so that the ladder forms an inverted U-shape and so that welds between the stringers (sides) and cross members (middle) face away from cables.

C. Ladder rack/tray shall be secured to the structural ceiling, building truss system, wall, floor, or the tops of equipment racks and/or cabinets using the manufacturer’s recommended supports and appropriate installation hardware and methods as defined by local code or the authority having jurisdiction (AHJ).

D. Ladder rack/tray splices will be made in mid-span, not over a support, with the manufacturer's recommended splice hardware.

E. Ladder rack/tray shall be supported every 5' or less in accordance with TIA-569. Ladder rack/tray shall be supported within 2' of every splice and within 2' on both/all sides of every intersection. Support ladder rack/tray within 2' on both sides of every change in elevation. Support ladder rack/tray every 2' when attached vertically to a wall.

F. When the pathway is overhead, ladder rack/tray shall be installed with a minimum clearance of 12" above the ladder rack/tray. Leave a minimum of 12" in between ladder rack/tray and ceiling/building truss structure. Leave a minimum of 3" in between ladder rack/tray and the tops of equipment racks and/or cabinets. Multiple tiers of ladder rack/tray shall be installed with a minimum clearance of 12" in between each tier of ladder rack/tray. When located above an acoustical drop ceiling, leave a minimum of 3" clearance between the top of the drop ceiling tiles and the bottom of the ladder rack/tray.

G. All threaded rod used in support of overhead cable trays shall have cable guard protectors installed over the exposed threaded rod in the area of the tray. The exposed end of the threaded rod hangers shall be cut flush with the mounting brackets, filed, and painted to match site conditions. Install rubber finishing caps on any exposed metal end rail or potential sharp point.

H. When installed under a raised floor, ladder rack/tray shall be installed with a minimum 3" clearance between the top of the ladder rack/tray and the bottom of the floor tiles or floor system stringers, whichever is lower in elevation. Maintain a 3" clearance between ladder racks/trays wherever ladder racks/trays cross.

I. Within each telecommunications room, ladder rack/tray should be bonded together, electrically continuous, and bonded to the TGB unless otherwise noted in the specifications and contract documents. Ladder rack/tray and turns shall be bonded across each splice with a bonding kit. Ladder rack/tray shall be bonded to the Telecommunications Grounding Busbar (TGB) using an approved ground lug on the ladder rack/tray and a minimum #6 grounding wire or as recommended by the AHJ. Remove paint from the ladder rack/tray where bonding/ground lugs contact the ladder rack/tray so that the lug will contact bare metal. Use antioxidant joint compound in between the bare metal on the ladder rack/tray and ground lug. Use antioxidant joint compound in between the bus bar and the ground lug. Verify continuity through the bonds at splices and intersections between individual ladder rack/tray sections and turns and through the bond to the TGB.

J. The quantity of cables within the ladder rack/tray will not exceed a whole number value equal to 50% of the interior area of the ladder rack/tray divided by the cross-sectional area of the cable. The interior area of ladder rack/tray will be considered to be the width of the ladder rack/tray. The interior area of ladder rack/tray equipped with cable retaining posts will be considered to be the width of the ladder rack/tray multiplied by a height of 6". Actual cable fill for ladder rack/tray that is not equipped with cable retaining posts will not exceed 2" in height. Actual cable fill for ladder rack/tray equipped with cable retaining posts will not exceed 6" in height.

K. The combined weight of cables withing the ladder rack/tray will not exceed the stated load capacity of the ladder rack/tray as stated in the manufacturer's product specifications or load/design tables.

L. Cables (cables bundles) will be secured to the cross members of ladder rack/tray with ¾ wide reuseable straps. Straps are not required when ladder rack/tray is equipped with cable retaining posts.

M. Use a radius drop to guide cables wherever cable exits overhead ladder rack/tray to access a rack, cabinet or wall-mounted rack, and cabinet or termination field. Provide a support other conductors that should be physically separated from cables within the ladder rack/tray as defined by local code or the authority having jurisdiction (AHJ).

N. Whenever possible, maintain a 2’ separation between ladder rack/tray used for communications cables and pathways for other utilities or building services.

O. The installer will provide touch-up paint color-matched to the finish on the ladder rack/tray and will correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process prior to delivery to the owner. If a component is cosmetically damaged to the extent that correction in the field is obvious against the factory finish, the component will be replaced with a new component finished from the factory. If a component is physically damaged due to mishandling or modification during the installation process, it shall not be used as part of the ladder rack/tray system.

P. Runway shall be installed in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of NEC, applicable portions of NFPA 70B and NECA’s “Standards of Installation” pertaining to general electrical installation practices.

Q. Coordinate installation of runway with other electrical work as necessary to properly interface installation of wire basket runway with other work.

R. Provide sufficient space encompassing runways to permit access for installing and maintaining cables.

S. Test runways to ensure electrical continuity of bonding and grounding connections and to demonstrate compliance with specified maximum grounding resistance.

End of Section

SECTION 27 13 00

COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this Section.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. This section describes the products and execution requirements relating to telecommunications voice, data and video backbone cabling and termination components.

C. Backbone Cabling is the cable and hardware interconnecting telecommunication rooms (TRs), building demarcation rooms, equipment rooms and server rooms. The backbone cabling shall consist of the following cable types:

1. 50-micron Multimode Fiber Optic Cable
2. Singlemode Fiber Optic Cable

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 23 – Pathways for Technology Systems

D. Section 27 05 26 – Grounding and Bonding for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 11 00 – Communications Equipment Rooms

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 18 00 – Communications Labeling and Identification

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.10 TEST DATA – FIBER OPTIC MEDIA

A. The test result information for each link shall be recorded in the memory of the field tester upon completion of the test.

B. The test result records saved by the tester shall be transferred into a Windows-based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee shall be made that these results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test.

C. The database for the completed job shall be stored and delivered on CD-ROM. This CD-ROM shall include the software tools required to view, inspect, and print any selection of test reports.

D. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:

1. The identification of the link in accordance with the naming convention defined in the overall system documentation.

2. The overall Pass/Fail evaluation of the link-under-test including the Attenuation worst-case margin (margin is defined as the difference between the measured value and the test limit value as defined in this document).

3. The date and time the test results were saved in the memory of the tester.

E. The following general information is to be provided in the electronic database containing the test result information for each link:

1. The identification of the customer site as specified by the end user.

2. The overall Pass/Fail evaluation of the link-under-test.

3. The name of the standard selected to execute the stored test results.

4. The cable type and the value of the ‘index of refraction’ used for length calculations.

5. The date and time the test results were saved in the memory of the tester.

6. The brand name, model, and serial number of the tester.

7. The revision of the tester software and the revision of the test standards database in the tester.

F. The detailed test results data to be provided in the electronic database for each tested optical fiber shall contain the following information:

1. The identification of the link/fiber in accordance with the naming convention defined in the overall system documentation.

2. The insertion loss (attenuation) measured at each wavelength, the test limit calculated for the corresponding wavelength, and the margin (difference between the measured attenuation and the test limit value).

G. The link length shall be reported for each optical fiber for which the test limit was calculated.

H. Contractor shall provide accurate as-built Construction Drawings at the site during construction.

I. The Drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (".dwg", AutoCAD rel. 2004 and ".dxf") formats on which as-built construction information can be added. These documents will be modified accordingly by the Contractor to denote as-built information as defined above and returned to the Owner.

J. The Contractors shall annotate the base Drawings and return to the Consultant in hard copy (same plot size as originals) and electronic (AutoCAD rel. 2004 and ".dxf") form.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 FIBER OPTIC CABLING

A. Inter Building Stranded Backbone (OSP)

1. All cable shall be manufactured and constructed for use in the Outside Plant Environment and shall meet one of the following, per bid document.

2. Outside Plant (OSP) loose tube all dielectric - Dielectric design with MDPE sheath jacket and no metallic elements to provide environmental protection.

3. Buffer tubes and optical fibers.

4. Industry standard buffer tubes stranded around a central strength member and compatible with standard hardware, cable routing, and fan-out kits.

5. Industry standard buffer tubes stranded around a central strength member and compatible with standard hardware, cable routing, and fan-out kits.

6. Optical fibers shall be industry-standard color coded and separated into 12-fiber color-coded binder groups surrounded by plastic core tubes.

7. Water blocking.

8. OSP Fiber Cables utilize dry water-blocking compound suitable for underground conduit, direct burial, and aerial applications in cable and buffer tubes.

B. Intra Building Backbone Indoor/outdoor(ISP/OSP)

1. Indoor/Outdoor Cables - All cable shall be manufactured and constructed for use in the Outside Plant Environment and listed for use indoors per the National Electrical Code (NFPA-70) and shall meet both of the following, per bid document.

2. Indoor Plenum Rated Tight Buffered Cable UL-listed OFNP cable: Tight buffer optical fibers, aramid strength yarn, and plenum-rated outer jacket.

3. Indoor Armored Plenum Rated Tight Buffered Cable UL-listed OFCP cable: Tight buffer optical fibers, aramid strength yarn, a plenum-rated outer jacket, aluminum.

C. Inter Building Backbone Indoor (ISP)

1. Indoor - All cable shall be listed for use indoors per the National Electrical Code (NFPA-70) and shall meet both of the following, per bid document.

2. Indoor Plenum Rated Tight Buffered Cable UL-listed OFNP cable: Tight buffer optical fibers, aramid strength yarn, and plenum-rated outer jacket.

3. Indoor Armored Plenum Rated Tight Buffered Cable UL-listed OFCP cable: Tight buffer optical fibers, aramid strength yarn, a plenum-rated outer jacket, aluminum.

D. Approved Manufacturer

1. Basis for Design Specifications: CommScope OM4 LazrSPEED multimode optical fiber, unless otherwise noted, in strand-count identified on Telecommunications Drawing and/or the Bid Document, and with the appropriate jacket material [OFNP or OFCP] for the pathway in which the cable will be routed.

2. Approved Manufacturer: CommScope

3. Example Catalog/Manufacturer Part Number: (other fiber counts available)

a. D-024-LN-5K-F12NS (760054296) 24-fiber All-Dielectric, Gel-Free, Outdoor Stranded Loose Tube Cable

b. D-024-LA-5K-F12NS (760053744) 24-fiber Armored, Gel-Free, Outdoor Stranded Loose Tube Cable

c. P-024-OD-5K-FSUBK (760037457) 24-fiber Indoor/Outdoor Plenum Distribution Cable, non armored cable type

d. P-024-DZ-5K-FSUAQ (760127910) 24-fiber Indoor Plenum Distribution Cable, interlocking aluminum armor

2.03 FIBER OPTIC CONNECTORS

A. The MM optical connector shall be LC UPC type.

B. The SM optical connector shall be LC UPC type.

C. The connector ferrule shall be ceramic or glass-in-ceramic. The optical fiber within the connector ferrule shall be secured with an adhesive.

D. The attenuation per mated pair shall not exceed 0.35 dB (individual) and 0.2 dB (average). Connectors shall sustain a minimum of 200 mating cycles per EIA/TIA-455-21 without violating specifications.

E. The connector shall meet the following performance criteria:

1. Cable Retention (FOTP-6) 0.2 dB

2. Durability (FOTP-21) 0.2 dB

3. Impact (FOTP-2) 0.2 dB

4. Thermal Shock (FOTP-3)0.2 dB

5. Humidity (FOTP-5) 0.2 dB

F. Connectors shall be field terminated and polished or fusion spliced. Mechanical, quick connect, or index-gel based connectors are not allowed.

G. Connectors shall be CommScope Uniprise.

PART 3 - EXECUTION

3.01 GENERAL - INTER AND INTRA BUILDING FIBER BACKBONE CABLE

A. Contractor shall comply applicable codes, standards and with all local codes and requirements. It is the responsibility of the contractor to identify and adhere to any unique codes or requirements governed by the region where the work is to be performed.

B. Provide all necessary products for installation of Fiber Backbone cablings to, include cable attachments, etc.

C. Backbone cable shall be installed following industry standard practices.

D. Contractor shall not exceed the maximum pulling tension or the minimum bending radius for fiber cables per manufacturer's specifications.

E. All installations shall comply with:

1. ANSI/TIA/EIA – 568 Series Commercial Building Telecommunications Cabling Standard,

2. TIA – 569 Commercial Building Standard for Telecommunications Pathways and Spaces,

3. ANSI/TIA/EIA – 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

4. ANSI-J-STD – 607 Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

5. NFPA 70 – National Electric Code

6. BICSI – Telecommunications Distribution Methods Manual

F. Cable and Termination Panel Labeling

1. Label the installed cables in accordance with Section 27 05 53

G. Cable Support

1. Provide cable supports and clamps to attach cables to backboards and walls.

2. Attach horizontal and vertical backbone cables at 2-foot intervals using Owner approved supports; such as D-rings or jumper troughs utilized for wire management.

3. Attach cables to manhole racks using Owner approved methods

4. Backbone cabling shall be secured to the cable/ladder tray following manufacturer recommended procedures and appropriate installation hardware and methods as defined by local code or the authority having jurisdiction (AHJ).

H. Record Drawings

1. CAD Files: Provide CAD files in .dwg format showing floor plans with room numbers and actual backbone cabling and pathway locations and labeling. The deliverable is required within 5 business days of final cable testing.

2. Red Line Drawings: Contract must keep one (1) full size set of floor plans on site during work hours showing installation progress marked and backbone cable labels noted. Contractor may be asked to produce these drawings for examination during construction meetings or field inspections

3.02 TESTING

A. Refer to Section 27 00 00 for additional requirements.

B. Field Test Requirements for Fiber Optic Cabling System

1. The fibers utilized in the installed cable shall be traceable to the manufacturer. Upon request by the Owner, the Contractor shall provide cable manufacturer's test report for each reel of cable provided. These test reports shall include the manufacturers on reel attenuation test results at 850-nm and 1300-nm for each optical fiber of each reel prior to shipment from the manufacturer.

2. Factory data shall be provided upon request, showing on-the-reel bandwidth performance results as tested at the factory.

3. Every fiber optic backbone link in the installation shall be tested in accordance with the field test specifications defined by the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-C or by the appropriate network application standard(s), whichever is more demanding.

4. The test shall include the representative connector performance at the connecting hardware associated with the mating of patch cords. The test does not, however, include the performance of the connector at the interface with the test equipment.

5. 100% of the installed cabling links shall be tested and shall pass the requirements of the standards mentioned above and as further detailed in this document. Any failing link shall be diagnosed and corrected at no additional cost to the Owner. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with RFP.

6. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

   a. The manufacturer of the fiber optic cable and/or the fiber optic connectors

   b. The manufacturer of the test equipment used for the field certification

   c. Training organizations authorized by BICSI

7. Field test instruments for multimode fiber cabling shall meet the requirements of ANSI/TIA/EIA-526-14-A. The light source shall meet the launch requirements of ANSI/EIA/TIA-455-50B, Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-C.1) with a Category 1 light source.

8. Field test instruments for singlemode fiber cabling shall meet the requirements of ANSI/EIA/TIA-526-7.

9. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.

10. The fiber optic launch cables and adapters shall be of high quality and the cables shall not show excessive wear resulting from repetitive coiling and storing of the tester interface adapters.

11. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests.

12. Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.

13. A representative of the Owner shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing begins.

14. A representative of the Owner will select a random sample of 5% of the installed links. The results obtained shall be compared to the data provided by the installation Contractor. If more than 2% of the sample results differ in terms of the Pass/Fail determination, the installation Contractor, under supervision of the Owner representative, shall repeat 100% of the testing. The cost of retesting shall be borne by the installation Contractor.

C. Fiber Performance Test Parameters

1. The link attenuation shall be calculated by the following formulas specified in ANSI/TIA/EIA standard 568-B.

   a. Link Attenuation = Cable_Attn + Connector_Attn + Splice_Attn

   b. Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)

   c. The values for the Attenuation_Coefficient are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation_Coefficient (dB/km)
Multimode 62.5/125 µm	850	3.5
	1300	1.5
Multimode OM3 50/125 µm	850	3.5
	1300	1.5
Multimode OM4 50/125 µm	850	3.0
	1300	1.5
Singlemode (Inside plant)	1310	0.5
	1550	0.4
Singlemode (Outside plant)	1310	0.4
	1550	0.5

   d. Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)

   e. Maximum allowable mated connectors_loss = 0.50 dB

   f. Splice_Attn (dB) = number of splices (S) * splice_loss (dB)

   g. Maximum allowable splice_loss = 0.1 dB (when tested bidirectionally)

2. Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices—i.e., it does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

3. Test equipment that measures the link length and automatically calculates the link loss based on the above formulas is preferred.

4. The above link test limits attenuation are based on the use of the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.

5. The backbone link (multimode/singlemode) shall be tested in two directions at both operating wavelengths to account for attenuation deltas associated with wavelength.

6. Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A.

7. Because backbone length and the potential number of splices vary depending upon site conditions, the link attenuation equation shall be used to determine limit (acceptance) values.

8. Multimode backbone links are designed to be used with network applications that use laser light sources (underfilled launch conditions). However, the link attenuation equation has been based upon the use of a light source categorized as Category 1, Overfilled.

9. Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1. All singlemode links shall be certified with test tools using laser light sources at 1310 nm and 1550 nm.

3.03 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.04 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.05 FIBER OPTIC CABLE INSTALLATION REQUIREMENTS

A. Cable slack shall be provided in each backbone fiber optic cable. This slack is exclusive of the length of fiber that is required to accommodate termination requirements and is intended to provide for cable repair and/or equipment relocation. The cable slack shall be stored in a fashion as to protect it from damage and be secured in the termination enclosure or a separate enclosure designed for this purpose. Multiple cables may share a common enclosure.

B. A minimum of 15 feet of slack cable (each cable) shall be coiled and secured at each end.

C. Exact cable termination locations shall be field verified with Owner

D. All fiber armor cables shall be grounded at one end in the IDF room

E. Fiber armor cables shall be free of sharp edges and protected with heat shrink or electrical tape between end of fiber armor cable and grounding connector.

End of Section

SECTION 27 15 00

COMMUNICATIONS HORIZONTAL CABLING

PART 1 – GENERAL

1.01 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.

1.02 SCOPE

A. This section describes the products and execution requirements relating to telecommunications voice, data and video horizontal (station) cabling and termination components.

B. Horizontal cabling is the cabling between the work area telecommunications outlet and the telecommunications room (TR). Horizontal cabling is often referred to as “station cabling”.

C. The horizontal cabling system will consist of the following:

1. Unshielded Twisted Pair (UTP) Cable
2. Outlet Termination Modules (jacks)
3. Outlet Termination Plates
4. Horizontal Fiber Optic/Copper Composite Cabling
5. Above Ceiling Cable Support Systems
6. Horizontal Cable Testing Requirements
7. Cable Pathway/Sleeve Requirements

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 23 – Pathways for Technology Systems

D. Section 27 05 26 – Grounding and Bonding for Technology Systems

E. Section 27 11 00 – Communications Equipment Rooms

F. Section 27 13 00 – Communications Backbone Cabling

G. Section 27 16 00 – Communications Connecting Cords

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 40 00 – AV/Multimedia General Requirements

J. Section 27 41 00 – Audio Visual Systems

K. Section 27 51 00 – Distributed Communications Systems

L. Section 27 60 00 – Physical Security General Requirements

M. Section 27 64 00 – Video Surveillance System

N. Section 27 66 00 – Intrusion Detection System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 CATEGORY 6 HORIZONTAL COPPER CABLES

A. All cables and equipment shall be furnished, tested, installed, and wired by the Contractor.

B. All horizontal data cables shall terminate on modular patch panels in the telecommunications closet as specified on the Drawings.

C. All data drops shall utilize Category 6a cable unless noted otherwise.

D. This cable shall be suitable for installation free-air, in building risers, in conduit, and/or in cable tray and shall carry CMP rating.

E. The cable design described herein shall exceed transmission performance of Category 6a cables.

F. Category 6a cables shall be bundled separately from lower Category rated cabling.

G. Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code, and meet the specifications of NEMA (low loss), UL 444, and ICEA. Conductor shall also conform to the requirements for solid annealed copper wire in accordance with ASTM B 3.

H. All cables, termination components, and support hardware shall be furnished, tested, installed, and wired by the Contractor.

I. The jacket color for data cables shall be YELLOW.

J. IMPORTANT: Cable and termination components (jack, patch panel, wiring blocks) are specified to function as a system. The compatibility of the cable to be installed with the proposed termination components shall be recognized and documented by the termination component manufacturer.

K. Manufacturers:

1. CommScope Uniprise

2. Plenum Indoor Cable:

a. CS44P YEL C6A 4/23 U/UTP CPK 1KFT (UN874050014/10) 4-pair Category 6A U/UTP Cable, plenum, yellow jacket

3. Outdoor or Cable installed in wet areas:

a. 1592A BK 4/24 R1000 (760178129) 4-pair Category 6A F/UTP Cable, outdoor, black jacket, aluminum tape shield, inner jacket

2.03 INFORMATION OUTLET

A. General

1. Station cables shall each be terminated at their designated workstation location in the connector types described in the subsections below. Included are modular jacks, faceplates, and surface mount raceway. The combined assembly is referred to as the Standard Information Outlet (SIO). These connector assemblies shall snap into a mounting frame.

2. SIOs shall be mounted in new outlet boxes, where existing boxes are in place, on surface mount raceway typically in surface raceway with barrier, in floor mount interface boxes, or on power poles either currently owned or new.

3. The telecommunications outlet frame shall accommodate or incorporate the following:

4. A minimum of four (4) modular jacks when installed on a wall-mounted assembly.

5. A mechanism for adjusting the surface plate to a plumb position.

6. When multiple jacks are identified in close proximity on the Drawings. The Contractor shall determine the optimum compliant configuration based on the products proposed.

7. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the Contractor shall submit the proposed configuration for each SIO type for review by the Consultant.

B. Modular Jacks

1. Data jacks shall be non-keyed 8-pin modular jacks.

2. Termination components shall be designed to maintain the cable’s pair twists as closely as possible to the point of mechanical termination.

3. Jacks shall utilize a four-layer printed circuit board to control NEXT.

4. Jack housings shall fully encase and protect printed circuit boards and IDC fields.

5. Modular jack contacts shall accept 2500 plug insertions.
6. Modular jack contacts shall be formed flat for increased surface contact with mated plugs. These contacts shall be arranged on the PC board in two staggered arrays of four to maximize contact spacing and minimize crosstalk.
7. Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.
8. Contact Plating shall be a minimum of 50 micro inches of gold in the contact area over 50 micro-inches of nickel, compliant with FCC part 68.5.
9. Jack termination shall be 110 IDC, integral to the jack housing, laid out in two arrays of four contacts.
10. Jacks shall utilize a paired punch down sequence. Cable pairs shall be maintained up to the IDC, terminating all conductors adjacent to its pair mate to better maintain pair characteristics designed by the cable manufacturer.
11. Jacks shall utilize tin lead plated (60% tin/40%lead) phosphor bronze 110 insulation displacement contacts.
12. Jacks shall terminate 22-26 AWG stranded or solid conductors.
13. Jacks shall terminate insulated conductors with outside diameters up to .050”.
14. Jacks shall be compatible with single conductor 110 impact termination tools.
15. Jacks shall be compatible with EIA/TIA 606 color code labeling and accept snap on icons for identification or designation of applications.
16. Jacks shall be ORANGE in color.
17. Jacks shall be marked as either T568A or T568B wiring.
18. Category 6a jacks shall be manufactured by:
19. Uniprise
    a. UNJ10G-OR (760241175) Category 6A U/UTP Information Outlet, orange

C. Transition Point (Ceiling Connector Assembly)

1. The assembly shall be plenum rated.
2. Does not require special tooling for termination.
3. Accepts solid or stranded conductors (22-26 AWG)
4. Assembly accommodates Category 6A cabling to facilitate transition of OSP to indoor cable.
5. Available with pre-installed 18” Category 6 or Category 6A single ended cord to support Mod Plug Terminated Links (MPTL)
6. Approved Manufacturer: CommScope
    a. CEILING CONN ASSEMBLY (760234921) Ceiling Connector Assembly, white

D. Outlet Faceplates

1. Faceplates shall match the electrical outlets for material type and color. Faceplates should be brushed stainless steel.

2. Faceplates shall incorporate recessed designation strips at the top and bottom of the frame for identifying labels. Designation strips shall be fitted with clear plastic covers.

3. Any unused jack positions shall be fitted with a removable blank inserted into the opening.

4. Modular jacks shall have capability to incorporate a dust cover that fits over and/or into the jack opening. The dust cover shall be designed to remain with the jack assembly when the jack is in use. No damage to the jack pinning shall result from insertion or removal of these covers. Dust covers that result in deformation of the jack pinning shall not be accepted.

5. Wall-mounted “voice only” outlets shall be installed where identified on the floor plan Drawings to accommodate wall-mounted telephone sets. The wall plate shall be of stainless steel construction, accommodate one RJ-45 jack, mount on a standard single gang outlet box or bracket, and include mating lugs for wall phone mounting.

6. All standard information outlets and the associated jacks shall be of the same manufacturer throughout each/the building. An allowable exception, however, is the wall-mounted “voice only” outlet described above.

7. Faceplates shall be manufactured by modular jack manufacturer.

E. Surface Mount Interface Box

1. Faceplates shall match the electrical outlets for material type and color. Faceplates should be brushed stainless steel.

2. Faceplates shall incorporate recessed designation strips at the top and bottom of the frame for identifying labels. Designation strips shall be fitted with clear plastic covers.

3. Any unused jack positions shall be fitted with a removable blank inserted into the opening.

4. Modular jacks shall have capability to incorporate a dust cover that fits over and/or into the jack opening. The dust cover shall be designed to remain with the jack assembly when the jack is in use. No damage to the jack pinning shall result from insertion or removal of these covers. Dust covers that result in deformation of the jack pinning shall not be accepted.

5. Wall-mounted “voice only” outlets shall be installed where identified on the floor plan Drawings to accommodate wall-mounted telephone sets. The wall plate shall be of stainless steel construction, accommodate one RJ-45 jack, mount on a standard single gang outlet box or bracket, and include mating lugs for wall phone mounting.

6. All standard information outlets and the associated jacks shall be of the same manufacturer throughout each/the building. An allowable exception, however, is the wall-mounted “voice only” outlet described above.

7. Faceplates shall be manufactured by modular jack manufacturer.

F. Surface Mount Interface Box

1. Low profile surface mount boxes shall incorporate recessed designation strips at the top for identifying labels. Designation strips shall be fitted with clear plastic covers.

2. The box shall feature built-in cable management for both fiber and copper applications.

3. Any unused jack positions shall be fitted with a removable blank inserted into the opening.

4. Modular jacks shall have capability to incorporate spring-loaded shutter door for added protection from dust and other airborne contaminants. The dust cover shall be designed to remain with the jack assembly when the jack is in use.

5. The box shall have the capability to incorporate optional magnets that can be internally mounted.

6. Surface mount box shall be manufactured by modular jack manufacturer.

    a. Provide - M101SMB-B-262 type surface mount box, single port white only for access points.

2.04 HORIZONTAL COMPOSITE MM FIBER OPTIC/COPPER CABLING FOR EXTENDED ETHERNET WITH POE

A. For devices that are beyond the distance limitation of UTP cabling and require PoE to operate, such as IP surveillance cameras and wireless access points, the Contractor, as noted on the drawings, shall provide a composite 2-strand OM4 MM fiber optic cable with an 18 awg 2-conductor stranded copper cable for power within a single jacket. The Contractor shall provide 12 awg when required based on distances and voltage drop.

B. Provide SC, ST, or LC connectors has required for the application and devices the fiber will be connecting to.

C. All pre-terminated and field terminated fiber shall be tested and certified with an OTDR and meet OM4 standards.

D. Provide plenum, riser, or OSP rated cable as required for the application.

E. Manufacturer:

1. CommScope Powered Fiber

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TWISTED PAIR TEST EQUIPMENT

A. Test equipment used under this contract shall be from a manufacturer who has a minimum of five years' experience in producing field test equipment. Manufacturers shall be ISO 9001 certified.

B. All test tools of a given type shall be from the same manufacturer and have compatible electronic results output. Test adapter cable shall be approved by the manufacturer of the test equipment. Baseline accuracy of the test equipment shall exceed TIA Level III, as indicated by independent laboratory testing.

C. Test equipment shall:

1. Be capable of certifying Category 5E, 6 and 6A permanent links.

2. Have a dynamic range of at least 100dB to minimized measurement uncertainty.

3. Be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

4. Include S-band time domain diagnostics for NEXT and return loss.

5. Be capable of running individual NEXT, return loss, etc., measurements in addition to AutoText.

6. Include a library of cable types, stored by major manufacturer.

7. Store at least 1000 Category 5e, 6 or 6A autotests in internal memory.

D. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurements.

E. The approved manufacturer of the test equipment is Fluke.

3.03 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.04 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.05 STATION CABLING

A. Information outlet cables with copper media (voice & data UTP and “TV” coax) shall be located as detailed on the Project Drawings.

B. The Contractor shall utilize these documents in determining materials quantities and routing.

C. Station cables shall be run to the information outlet from the telecommunications room serving each area in conduit, free-air above drop ceiling, in cable tray, and/or in modular furniture.

D. The maximum station cable drop length for UTP cables shall not exceed 295 feet (90 meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and shall include any slack required for the installation and termination. The Contractor shall install station cabling in a fashion to avoid unnecessarily long runs.

E. Contractor shall verify cable lengths comply with published standards; prior to installation of any horizontal cabling, this Contractor shall verify cable paths and confirm no horizontal cable will exceed 295 total feet. If it is determined that the cable will exceed 295’, this Contractor shall route the cabling to another telecommunications room or determine shorter path so cables are under 295’. If this is not possible, the Contractor shall notify the Consultant prior to installation. Failure to do this step will not result in a change order from the Contractor.

F. All cables shall be installed splice-free unless otherwise specified.

G. During pulling operation, an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

H. Avoid abrasion and other damage to cables during installation.

I. All cable shall be free of tension at both ends. In cases where the cable shall bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.

J. Where installed free-air, installation shall consider the following:

1. Cable shall run at right angles and be kept clear of other trades’ work.

2. Cables shall be supported according to code, using “J-hooks” anchored to ceiling concrete, walls, piping supports, or structural steel beams.

3. Hooks shall be designed to maintain cable bend to larger than the minimum bend radius (typically 4x the cable diameter).

4. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable “sag” at mid-span exceeds 6 inches, another support shall be used.

5. Contractor must provide a cable support system secured to the building structure rigidly with allowed attachments and/or provide a secure support cables independently at both ends above suspended ceiling per NEC requirements.

K. Cable shall never be laid directly on the ceiling grid.

L. Cables shall not be attached to existing cabling, plumbing, or steam piping, ductwork, ceiling supports, or electrical or communications conduit.

M. Manufacturers’ minimum bend radius specifications shall be observed in all instances. Use of plastic cable ties is not acceptable. Cable bundles shall be neatly dressed with use of Velcro type straps.

N. Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.

O. A coil of one foot in each cable shall be placed in the ceiling at the last support (e.g., J-hook) before the cables enter a fishable wall, conduit, surface raceway, or box. At any location where cables are installed into movable partition walls or modular furniture via a service pole, approximately 15 feet of slack shall be left in each station cable under 250 feet in length to allow for change in the office layout without re-cabling. These “service loops” shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

P. To reduce or eliminate EMI, the following minimum separation distances from ≤480V power lines shall be adhered to:

1. Twelve (12) inches from power lines of <5-kVa

2. Eighteen (18) inches from high voltage lighting (including fluorescent)

3. Thirty-nine (39) inches from power lines of 5-kVa or greater

4. Thirty-nine (39) inches from transformers and motors

Q. All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.

3.06 INFORMATION OUTLET

A. Information outlets shall be flush mounted on wall-mounted boxes, in floor-mounted boxes, on surface raceway, or on modular furniture.

B. Any outlets to be added where these conditions are not met shall be positioned at a height matching that of existing services or as directed otherwise by the Site Coordinator and the Consultant. Nominal height (from finished floor to center line of outlet) in new installation shall be as follows:

1. Standard Voice & Data Outlet (SIO) shall match adjacent electrical outlets.

2. Wall-Mounted Telephone Outlet (Standard Voice only) shall meet ADA requirements for both front and side reach access.

C. The Contractor shall coordinate the style of the telecommunication outlets to be installed in the floor mount boxes and surface mount raceways with the Owner.

3.07 ELEVATOR INTERFACE

A. The Contractor shall furnish and install an elevator interface box outside of the elevator equipment room.

1. The Contractor shall provide an elevator telecommunications junction box located outside of the Elevator Machine Room for interface of telecommunication cable to the elevator cab(s). This requirement complies with ANSI A17.1 code which prevents work within the Elevator Machine Room other than specific elevator work.

2. Telecommunications J-box shall include a keyed lockable door. Additionally, the J-box shall have proper punch down blocks and data jacks suitable for terminating all cables within the J-box.

3. The Contractor shall provide any voice/data cables to this enclosure as required.

4. Electronics or cable for other systems, such as security, shall not be placed within this enclosure.

5. Coordinate exact location of elevator security junction box with the Elevator Contractor, Architect, and Consultant, prior to installation elevator Cell Telephone Unit. Coordinate with Owner.

6. Provide/install the following:

a. *A 2'x2' fire rated plywood at 54" AFF center.

b. * A 120VAC duplex at top center of plywood.

c. * (1) 1" conduit from top right of plywood to ceiling space.

d. * (1) CAT6A drop from the 110 block cell device unit to the elevator equipment.

7. Cables entering the elevator telecommunications J-box and elevator equipment room shall be appropriately labeled by the Contractor so that the Elevator Contractor can connect the appropriate wires to the elevator controllers. Wires should be individually labeled to separate them from other elevator functions and to assist the Elevator Contractor in making proper connection points.

3.08 CABLE TERMINATION

A. At the telecommunication closet, all data and voice cables shall be positioned on termination hardware in sequence of the outlet ID, starting with the lowest number.

B. Termination hardware (blocks and patch panels) positioning and layout will be reviewed and approved by the Consultant prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.

1. Cable Termination – Data/Voice UTP

a. Data/voice patch panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.

b. Data patch panels shall be sized to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.

c. At information outlets and data/voice patch panels, the installer shall ensure that the twists in each cable pair are preserved to within 0.5 inch of the termination for data/voice cables. The cable jacket shall be removed only to the extent required to make the termination.

2. Cable Termination – Fiber Optic

a. All fibers shall be terminated using the specified connector type.

b. All terminated fibers at the telecommunications closets shall be mated to couplings mounted on patch panels. Couplings shall be mounted on a panel that, in turn, snaps into the housing assembly. Any unused panel positions shall be fitted with a blank panel inhibiting access to the fiber optic cable from the front of the housing.

c. All couplings shall be fitted with a dust cap.

d. Fibers from multiple locations may share a common enclosure, but they shall be segregated on the connector panels and clearly identified. Fibers from multiple destinations may be secured in a common enclosure, provided they are clearly identified as such. Fibers from different locations shall not share a common connector panel (e.g., “insert”).

e. Slack in each fiber shall be provided as to allow for future re-termination in the event of connector or fiber end-face damage. Adequate slack shall be retained to allow termination at a 30” high workbench positioned adjacent to the termination enclosure(s). A minimum of one meter (~39”) of slack shall be retained regardless of panel position relative to the potential work area.

f. If the cable is armored the Contractor shall install a plastic twist-on bushing on each end of interlocking armored fiber to protect cable from sharp edges of the armor.

3.09 TEST DATA – COPPER MEDIA

A. The test result records saved by the tester shall be transferred into a Windows-based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee shall be made that these results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test. Comma separated value (CSV) format is not acceptable.

B. The database for the completed job – including twisted-pair copper cabling links, if applicable –shall be stored and delivered on CD-ROM. This CD-ROM shall include the software tools required to view, inspect, and print any selection of test reports.

C. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:

1. The identification of the link in accordance with the naming convention defined in the overall system documentation.

2. The overall Pass/Fail evaluation of the copper channel-under-test, including the NEXT worst-case margin (margin is defined as the difference between the measured value and the test limit value).

3. The overall Pass/Fail evaluation of the fiber link-under-test, including the Attenuation worst-case margin (margin is defined as the difference between the measured value and the test limit value).

4. The date and time the test results were saved in the memory of the tester.

3.10 COPPER STATION CABLES

A. Station cabling testing shall be from the jack at the outlet in the work area to the patch panel on which the cables are terminated.

B. Testing shall be of the permanent link. Contractor shall warrant performance, however, based on channel performance and provide patch cords that meet channel performance criteria. All cabling not tested strictly in accordance with these procedures shall be retested at no cost to the Owner.

C. Testing shall be from the jack at the SIO to the patch panel on which the cables are terminated at the wiring hub.

D. Horizontal “station” cables shall be free of shorts within the pairs and shall be verified for continuity, pair validity and polarity, and wire map (conductor position on the modular jack). Any defective, split, or mispositioned pairs shall be identified and corrected.

E. Testing of the cabling systems rated at TIA Category 5e/6/6a and above shall be performed to confirm proper functioning and performance.

F. Testing of the transmission performance of station cables (Category 5e/6/6a) shall include the following:

1. Length
2. Attenuation
3. Pair to Pair NEXT
4. ACR
5. PSNEXT Loss
6. Return Loss
7. Pair to Pair ELFEXT Loss or ACRF
8. PSEFEXT Loss or PS-ACRF
9. Propagation Delay
10. Delay Skew
11. Return Loss

G. The maximum length of station cable shall not exceed 90 meters, which allows 10 meters for equipment and patch cables.

H. Worst case performance at 20°C, based on a horizontal cable length of 90 meters and equipment cord length of 4 meters, shall be as follows:

1. CATEGORY 6a (Permanent LINK)

Frequency (MHz)	Insertion Loss (Maximum dB)	NEXT Loss Pair to Pair (dB)	PS-NEXT Loss (dB; Worst Case)	ACRF Pair to Pair (dB)	PS-ACRF (dB)
1.0	1.9	65.0	62.0	64.2	61.2
4.0	3.5	64.1	61.8	52.1	49.1
8.0	5.0	59.4	57.0	46.1	43.1

Frequency (MHz)	Insertion Loss (Maximum dB)	NEXT Loss Pair to Pair (dB)	PS-NEXT Loss (dB; Worst Case)	ACRF Pair to Pair (dB)	PS-ACRF (dB)
10.0	5.5	57.8	55.5	44.2	41.2
16.0	7.0	54.6	52.2	40.1	37.1
20.0	7.8	53.1	50.7	38.2	35.2
25.0	8.8	51.5	49.1	36.2	33.2
31.25	9.8	50.0	47.5	34.3	31.3
62.5	14.1	45.1	42.7	28.3	25.3
100.0	18.0	41.8	39.3	24.2	21.2
200.0	26.1	36.9	34.3	18.2	15.2
250.0	29.5	35.3	32.7	16.2	13.2
300.0	32.7	34.0	31.4	14.6	11.6
400.0	38.5	29.9	27.1	12.1	9.1
500.0	43.8	26.7	23.8	10.2	7.2

I. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacements, and changes as necessary and shall then repeat the test or tests that disclosed faulty or defective material, equipment, or installation method. The Contractor shall make additional tests as the Consultant deems necessary at no additional expense to the Owner or Consultant.

J. All data shall indicate the worst-case result, the frequency at which it occurs, the limit at that point, and the margin. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements. Information shall be provided for all pairs or pair combination and in both directions when required by the appropriate standards.

K. Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify “PASS” on each cable and display the specified parameters—comparing test values with standards-based “templates” integral to the unit.

End of Section

SECTION 27 16 00

COMMUNICATION CONNECTING CORDS

PART 1 - GENERAL

1.01 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.

1.02 SCOPE

A. This section describes the products relating to high quality Category 6 voice and data patch cords.

B. In this section the term patch cords refers to the cords that connect Owner provided data network electronics to the horizontal cable infrastructure.

C. It is important that the horizontal cable system and the provided patch cords work as one complete system for guaranteed channel performance. Patch cords shall be manufactured by the same manufacturer as the jack and patch panels.

D. The Contractor shall provide and deliver all cords as listed in this section. The Owner will be responsible for installation of cords.

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 23 – Pathways for Technology Systems

D. Section 27 05 26 – Grounding and Bonding for Technology Systems

E. Section 27 11 00 – Communications Equipment Rooms

F. Section 27 13 00 – Communications Backbone Cabling

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 40 00 – AV/Multimedia General Requirements

J. Section 27 41 00 – Audio Visual Systems

K. Section 27 51 00 – Distributed Communications Systems

L. Section 27 60 00 – Physical Security General Requirements

M. Section 27 64 00 – Video Surveillance System

N. Section 27 66 00 – Intrusion Detection System

O. Section 28 13 16 – Electronic Access Control System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 CATEGORY 6A PATCH CORDS

A. The Owner has the right to determine the final length of the patch cords after the contract is awarded.

B. All patch cords shall be round and consist of eight insulated 23 stranded copper conductors, arranged in four color-coded twisted pairs within a flame-retardant jacket, and be backwards compatible with lower performing categories. Modular patch cords shall utilize ISO termination method that is designed to reduce and control near-end cross talk (NEXT) and far end cross talk (FEXT) without compromising signal impedance.

C. Both ends of the cord shall be equipped with modular 8-position (RJ45 style) plugs wired straight through with standards compliant wiring. All modular plugs shall exceed FCC CFR 47 part 68 subpart F and IEC 603.7 specifications and have 50 micro inches of gold plating over nickel contacts. Cable shall be label-verifiable. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level. Patch cords shall have color-coded insert molded strain relief boot with a latch guard to protect against snagging. Additional color-coding shall be available by the use of snap-in icons.

D. Patch cords shall be wired straight through. Pin numbers shall be identical at each end and shall be paired to match T568B patch panel jack wiring per ANSI/TIA/EIA-568-B. Patch cords shall be unkeyed.

E. The manufacturer of the cords shall be the same as the manufacturer for UTP termination hardware (jacks & patch panels). Cords shall be highest quality patch cords available by connectivity manufacturer.

F. The patch cords shall match the Category rating of the jack and cable it will be connecting to.

G. Approved Manufacturer: CommSCope Uniprise

1. C0199K2-0ZF007 - MiNo6A Series Cat6A reduced diameter LS-CM Dual Rated Cord, 7' blue

2. C0199K2-0ZF010 - MiNo6A Series Cat6A reduced diameter LS-CM Dual Rated Cord, 10' blue

H. This Contractor shall provide the following patch cords: (for pricing purposes only; refer to section 3.04 below):

Qty	Length	Notes
50%	7 feet	Non-Plenum (50% Drop in Telecom Room)
50%	10 feet	Non-Plenum (50% Drop in Telecom Room)
1/per	10 feet	Non-Plenum Workstation Patch Cord
1 each	10 feet	Plenum – Access Points
1 each	10 feet	Plenum – IP Camera
1 each	10 feet	Shielded – Exterior IP Camera

2.03 FIBER OPTIC PATCH CORDS

A. The Owner has the right to determine the final length of the patch cords after the contract is awarded.

B. All MM fiber optic patch cords shall:

1. Be duplex 2-3mm tight buffer design with Aqua jacket.

2. Have LC-LC connectors with straight thru connectors (A-A Polarity).

3. Have 50-micron OM4 core.

4. Approved Manufacturer: CommScope

a. FEWLCLC42 (FEWLCLC42-JXF010) OS2 LC to LC, Fiber Patch Cord, 1.6 mm Duplex, Riser, yellow jacket, 10FT

b. FEXLCLC42 (FEXLCLC42-MXF010) OM4 LC to LC, Fiber Patch Cord, 1.6 mm Duplex, Riser, aqua jacket, 10 ft

C. All SM fiber optic patch cords shall:

1. Be duplex 2-3mm tight buffer design with Yellow jacket.

2. Have LC-LC connectors with straight thru connectors (A-A Polarity).

3. Have 8-9-micron OS2 core.

D. This Contractor shall provide the following patch cords (for pricing purposes only; see section 3.04 below):

Qty	Length	Notes
1/pr	10’	MM Non-Plenum (1per pair terminated)
1/pr	10’	SM Non-Plenum (1 per pair terminated)

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.04 ORDERING AND DELIVERY

A. Prior to ordering patch cords the Contractor shall schedule meeting with Owner and Consultant to verify patch cord lengths, colors and quantities.

B. Contractor shall coordinate delivery of patch cords with Owner. Contractor shall have list of delivered cords and shall have Owner sign delivery sheet at time of delivery.

End of Section

SECTION 27 18 00

COMMUNICATIONS LABELING AND IDENTIFICATION

PART 1 - GENERAL

1.01 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.

1.02 SCOPE

A. This section describes the products and execution requirements relating to labeling of telecommunications cabling, termination components, and related subsystems. Covered systems include the following:

1. Equipment room backboards and equipment racks
2. Station cable and terminating equipment
3. Telecommunications grounds and related components

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 23 – Pathways for Technology Systems

D. Section 27 05 26 – Grounding and Bonding for Technology Systems

E. Section 27 11 00 – Communications Equipment Rooms

F. Section 27 13 00 – Communications Backbone Cabling

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 40 00 – AV/Multimedia General Requirements

J. Section 27 41 00 – Audio Visual Systems

K. Section 27 51 00 – Distributed Communications Systems

L. Section 27 60 00 – Physical Security General Requirements

M. Section 27 64 00 – Video Surveillance System

N. Section 27 66 00 – Intrusion Detection System

O. Section 28 13 16 – Electronic Access Control System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

1.07 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 LABELS

A. All labels shall be permanent and be machine generated (e.g., Brady or Panduit). No handwritten or non-permanent labels shall be allowed. Labels shall be Brady “I.D. Pro” or XC-Plus or equivalent. Labeling on backboards and/or equipment racks may be pre-cut adhesive type.

B. Characters on all labels shall be black printed on a white background.

C. Label size shall be appropriate to the cable size(s), outlet faceplate layout, patch panel design, or other related equipment sizes and layouts.

D. All labels to be used on cables shall be self-laminating, white/transparent vinyl, and be wrapped around the cable sheath. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminated over the full extent of the printed area of the label.

E. Characters on all cable labels shall be visible all around the cable sheath.

F. Labels used to identify innerduct carrying fiber optic cable shall be labeled with a durable yellow polyethylene tag that reads “CAUTION Fiber Optic Cable” and includes blank spaces for adding (1) fiber count and (2) destination information. An example of a compliant product is VIP Products’ “Caution Write-On Coverall Tag.”

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.04 GENERAL

A. The Contractor shall match the Owner's standard labeling scheme.

B. Clean surfaces before attaching labels.

C. Install all labels firmly. Labels attached to terminating equipment such as backboards, faceplates, 110 blocks, and patch panels shall be installed plumb and neatly on all equipment.

3.05 LABELING OF CABLING AND TERMINATION COMPONENTS

A. Backboard and Equipment Racks

1. Backboards and equipment racks shall be labeled by the Contractor identifying the telecommunication room. Additionally, equipment racks shall have an alpha character after the room number unique to that particular communications closet. For example, TR1-A would be the first rack in TR1.

2. Character height shall be 1-inch (minimum).

B. Cabling

1. Horizontal cables shall have a machine generated wrap around cable label within 4" of each end of the cable. Label shall be clearly legible and meet TIA-EIA 606 standards. Character height shall be .25" (minimum).

2. Labeling cable identification shall be clearly uniform across the back of the patch panel without turning or violating the natural twist of all conductor pairs at the termination point.

3. Voice/data/video backbone cables shall have a machine generated wrap around cable label within 12" of each end of the cable. Label shall be clearly legible and meet TIA-EIA 606 standard. Character height shall be .5" (minimum).

3.06 FIBER OPTIC BACKBONE, RISER CABLES, AND TERMINATION COMPONENTS

A. All fiber optic backbone and copper (inter-building, riser, and tie) cables shall be identified AT BOTH ENDS with a designation that identifies where the opposite end of the same cable terminates (e.g., equipment room or telecommunications room I.D.). In addition, labeling of all fiber optic cables shall include the number of fibers in the cable.

B. Each fiber optic termination panel shall be clearly labeled indicating the destination of the cable(s) and the fiber number of each fiber position. The cable identifiers are to be secured to (1) the side and (2) the front cover of the panel enclosure.

3.07 STANDARD INFORMATION OUTLET (SIO) FACEPLATES

A. All faceplates shall be clearly labeled indicating the destination of the cable(s) (MDF or IDF A, IDF B, etc.) the data port number(s) on the data patch panel(s), and the voice cable number(s).

B. Telecommunications outlets are to be labeled (1) on the cover of the assembly and (2) on each cable terminated at that location.

C. Station cables shall be labeled within two inches of the cable end.

3.08 DATA PATCH PANELS

A. All data patch panels shall be clearly labeled indicating the data port number on the data patch panel (ports 1 through 48). Each telecommunication room shall start with ‘A’ and continue through the alphabet.

B. A data port schedule for each telecommunication room shall be created in spreadsheet format (Excel) with the telecommunication room MDF or IDF + alphabet letter designations, data port numbers, and room numbers identified in the spreadsheet. In addition, for each data patch panel port, a field shall be provided in the spreadsheet for the Owner to manage the cabling infrastructure by recording the device and any special notes pertaining to the room utilizing the data cable terminated to the port.

C. Refer to Telecommunication “T” Series Project Drawings for standard information outlet faceplate and data & voice patch panel labeling scheme requirements. A sample of the data and voice port schedules is to be provided to the Owner, in the cable record book and in electronic format (Excel spreadsheet), with final documents provided on the Project Drawings.

3.09 FIBER OPTIC CABLES AND TERMINATION COMPONENTS

A. All fiber optic cables, termination enclosures and connector panels, and splice closures shall be clearly labeled.

B. In addition, labeling of all fiber optic cables shall include the number of fibers in the cable.

C. Each fiber optic termination panel shall be clearly labeled indicating (1) the destination(s) of the cable(s) and (2) fiber number of each fiber position. The cable identifiers are to be secured to (1) the side and (2) the front cover of the panel enclosure.

3.10 GROUND SYSTEM LABELING

A. All grounds shall be labeled as close as practical to the point of termination (for ease of access to read the label). Labels shall be nonmetallic and include the following statement: “WARNING: If this connector or cable is loose or must be removed, please call the building telecommunications manger.” Refer to ANSI/TIA/EIA 606 for additional labeling requirements.

End of Section

SECTION 27 40 00

AV/MULTIMEDIA GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. Successful bidder shall provide, install, configure, and provide warranty service for audiovisual systems, including displays, audio/video/graphics switching and distribution systems, integrated control systems, and other equipment as described herein.

1.02 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 05 28 – Pathways for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 15 00 – Communications Horizontal Cabling

G. Section 27 16 00 – Communications Connecting Cords

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 41 00 – Audio Visual Systems

1.03 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

1. General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

2. Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

3. Execution: Coordination, testing, training, warranty, and cable management.

1.04 DEFINITIONS

A. HDCP: High-bandwidth Digital Content Protection or a security protocol designed to limit unauthorized use of protected content. Where applicable, HDCP compliant devices shall be utilized per design specifications. Use of HDCP compliant systems designed herein is the responsibility of the end user and compliance with Owner's Fair Use policies.

B. EDID, E-EDID: Extended Display Information Data, Enhanced-Extended Display Information Data or a remotely readable (read by a source) data file that resides in a display or specialized audiovisual device – commonly referred to as a "sink" – describing the capabilities of the sink to a connected source.

C. Configuration: the software and firmware programming that defines and creates the functionality, levels, presets, and settings of devices.

D. Configure: To define functionality, levels, presets, and settings of device(s) using software and/or firmware.

E. Programmer: Contractor personnel engaged in developing the configuration of systems.

F. DSP: Digital Signal Processing, or Digital Signal Processor.

G. AEC: Acoustic Echo Cancellation.

H. Fixed Architecture: Referring to software providing fixed processing paths with adjustable processing objects in a predetermined sequence.

I. Open Architecture: Referring to software providing infinitely variable Programmer selected processing paths with adjustable processing objects arranged in any sequence deemed appropriate by Programmer.

1.05 REFERENCE STANDARDS AND CODES

A.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

B. Primary AV Contractor shall have at least one (1) employee assigned to the project in a design or management role, and at least one (1) employee assigned to the project in an installing technician role, holding at least one of the follow certifications:

1. CTS (AVIXA)
2. CTS-I (AVIXA)
3. CTS-D (AVIXA)
4. EST-L2 (National Systems Contractor Association)

C. Refer to subsequent sections for section specific qualification requirements.

D. Contractor shall hold appropriate Audiovisual Provider of Excellence (APEx) certification.

1.07 SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

B. Structurally Mounted Elements: Including but not limited to monitors, projectors, projection screens, and loudspeakers.

C. Frequency Assignment Plans: Provide for all wireless microphones.

D. Custom Engraving: Layout and labeling/engraving of custom products, including wall plates and interconnection panels. Provide engraving detail with material and finish detail.

E. Power Distribution: Plan for distribution and switching of AC and DC power to all audiovisual devices, including sequencing order of outlets and banks. Time delay to be field configured as necessary for proper system power up and down.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

B. Quick-Reference Guides: Contractor shall create a concise quick-reference guide covering normal system operation and basic troubleshooting procedures for each room/system type. Length of each quick-reference guide shall be commensurate with the information needed for successful operation, subject to Owner approval.

1. Upon Owner approval, Contractor shall provide two (2) laminated copies and one (1) digital copy for each room/system type.

C. Serial Numbers: Contractor shall provide a list of serial numbers for all supplied components with serial numbers and with a unit price greater than $99. Organize list by room/system type.

1.10 CORRECTION PERIOD

A. Length of Period: Contractor shall offer a one year correction period to Owner for this system. Contractor shall repair all equipment and cabling problems at no additional cost to Owner during the correction period.

B. Commencement: Correction period shall begin at date of Final Acceptance.

C. Final Acceptance: shall be defined as the date at which all contract work (save for a correction period) is complete, including punch list completion & verification, closeout submittals, and written verification by the Owner is obtained by the Contractor that the systems have been accepted.

D. Response: Contractor shall respond by phone within two (2) hours to calls for service or assistance from Owner during normal business hours for the duration of the correction period.

E. On-site Response: Contractor shall respond on-site within eight (8) business hours from the time of the initial phone contact in the event that the issue cannot be resolved over the phone.

F. Equipment on Loan: Contractor shall loan equipment for any broken, defective, or non-functional equipment that cannot be repaired and returned within one week. Contractor shall provide shipping, delivery, and integration at no additional cost to Owner. Equipment shall be comparable in size, speed, brightness, and relevant performance specifications, as determined by Owner.

G. Projection Lamps: Projection lamps are to be warranted by Contractor for a minimum of 90 days, or the rated life expectancy of the lamp, whichever comes first.

H. Damaged Equipment: Equipment that is damaged due to intentional misuse, abuse or negligence is not covered under this warranty; however, Contractor shall assist Owner in putting the system back in working order in the shortest possible timeframe while charging normal service rates for labor and equipment.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 PRODUCT SPECIFICATIONS

A. Provisions: Product specifications are provided in subsequent sections to Contractor for the appropriate configuration and/or provision of accessories as well as for a guide to indicate key features for possible substitutions.

B. Where wireless microphone systems are specified, Contractor shall determine optimal frequency range for final product selection and submit Manufacturer's recommended frequency band for Owner and Consultant approval prior to ordering equipment. Contractor shall provide congruent frequency band products where like systems are specified for interoperability of components. Where three (3) or more wireless microphones are specified within the same system, Contractor shall provide and install necessary antennae distribution for optimal performance, to be submitted for Owner and Consultant approval during pre-construction phase.

2.03 MISCELLANEOUS MATERIAL

A. Required Equipment: Contractor shall provide additional system components typically and reasonably required to make system operational even though not specifically indicated in Drawings, Appendices or Specifications including, but not limited to, cable, connectors, connecting accessories, adaptors, power supplies, power strips, rack mounting adapters and shelves, cover plates and closure panels, relays and switches, remote antenna mounts, terminal blocks, and related connector and termination hardware required by but not supplied with the equipment.

B. Blank Fill Panels: Contractor shall provide blank fill panels to cover any openings in equipment racks provided under this contract whether specified in the equipment schedules or not. Fill panels shall match finish of specified rack hardware.

C. Power Distribution Strips: Contractor shall provide power distribution strips as necessary for distributing power within equipment racks and consoles. Strips shall be UL listed, be securely mountable, and appropriate for professional installation.

D. Wall Openings: Contractor shall provide blank faceplates to cover any unused openings within the project area. Faceplate type and finish to match electrical outlets in the project.

2.04 POWER DEVICES

A. Refer to Section 27 00 00 for additional requirements.

B. All audio amplifiers that do not provide a soft power on/ off sequence shall be on sequenced outlets.

2.05 CABLE

A. Cable shall be provided and installed as detailed herein. Cable installed that does not conform to these standards or that has not been given prior approval by Consultant shall be removed by Contractor and replaced at Contractor's sole expense.

B. Plenum: Plenum-rated cables shall be used where required by code or by best practices.

C. Installed Video: Video signal coaxial cables shall have #18 solid copper center conductor, gas-injected high-density Polyethylene or Fluorinated Ethylene Propylene insulation, copper braid shield of at least 95% coverage, and 100% dual-sided foil and black PVC jacket unless color is otherwise noted. Cable shall be designed as a low loss serial digital video cable. Belden 1694A, WestPenn 6350, Canare L-5CFB, Liberty 18-CMR-SD, or equal. Plenum cable, Belden 1695A, WestPenn 256350, Liberty 18-CMP-VID-COAX, or equal.

D. Flexible Video: Short video cables that are intended to be moved or adjusted on a regular, frequent basis may be constructed of a stranded bare copper center conductor RG-59/equivalent cable with >94% copper braid shield and polyethylene dielectric. Canare LV-61S, Belden 1505A, WestPenn 819, or equal. Plenum cable, Belden 1506A, WestPenn 25819, or equal.

E. High Resolution RGBHV Graphics/Video: Cable type and size shall be selected to provide a minimum of 250 MHz bandwidth (-3dB) at over the length of each RGBHV signal path from source to display, including losses and gains through cable loss, signal processing, switching, and distribution equipment. Manufacturer shall designate cable as suitable for high-resolution use. Extron MHR-5, Liberty RGB5C-25-CM, or equal. Plenum cable, Extron MHR-5P, Liberty RGB5C-25-CMP, or equal.

F. Installed Line Level and Microphone (single line): Audio signal cable shall have twisted pair #22 stranded tinned copper conductors, polyethylene conductor insulation, aluminum-polyester foil shield, #24 stranded tinned copper drain wire, and chrome PVC jacket. Belden 8761, West Penn 291, Canare L-2T2S, Liberty 24-2P-STAR, or equal. Plenum cable, Belden 88761 or equal.

G. Portable Microphone, Enclosure, and Breakout Line Level Audio: Cable shall have 4 conductors per channel arranged in star quad double-balanced pairing, #24 stranded conductors of at least 40 tinned annealed copper wires, 100% coverage wrap shield, tinned copper braid shield of approximately 50% coverage, uniformly round form and black PVC jacket. Canare L-4E6S, Belden 8723, WestPenn 355, or equal. Plenum Cable, Belden 88723, Liberty 24-4P-PLCSH-WHT, or equal.

H. Broadband Video Antenna Cable: For runs shorter than 15', RG-59. For runs 15'-50', RG-6.

I. Wireless Microphone Antenna Extension Cable: 50-Ohm coaxial cable or as directed by microphone manufacturer.

J. Loudspeaker Wire: 14 AWG minimum.

K. UTP Cable: Shall be consistent with Project standards for CAT-6 cable unless otherwise noted in specification or recommended by hardware manufacturer for use with their equipment.

L. Control: Shall be as recommended by equipment manufacturer, with the appropriate number of conductors for the application.

M. Cable Construction: Contractor shall fabricate interconnecting cables using products defined in this section unless equipment manufacturer-provided cable is of a specialized or proprietary nature. Pre-manufactured cables are subject to prior approval by Owner and Consultant.

N. Labels: Labels shall include a white paper or vinyl slip with typed or machine printed designations, secured in place with a wider section of clear heat shrink tubing or integral clear adhesive-backed plastic.

O. Terminations: Provide specialized terminating hardware as required.

P. Schedule: Contractor shall submit schedule prior to installation for Consultant review indicating cable types that will be used on the project.

2.06 CONNECTORS

A. Connectors shall be provided and installed as detailed herein. Connectors installed that do not conform to these standards or that have not been given prior approval by Consultant shall be removed by Contractor and replaced at Contractor's sole expense.

B. HDMI (Video/Audio/Control): Cables to be factory-terminated with molded strain relief.

C. BNC (Video): Video signal BNC connectors shall be 3-piece crimp-on type with insertion barrel and ferrule and gold flashed crimp-on center pin. Barrel shall provide full circumferential contact with the braid. Fittings shall be sized to fit the cable. Canare BCP-C series or equal. Crimping and die tools shall be Canare TC-1 Hand Crimp Tool with appropriate TCD die sets or equal.

D. RCA (Video): Video signal RCA connectors shall be 3-piece crimp-on type with gold flashed center pin, Canare RCAP-C series or equal. Crimping and die tools shall be Canare TC-1 Hand Crimp Tool with appropriate TCD die sets or equal.

E. F (Video): Video signal F connectors shall be 3-piece crimp-on type with gold flashed crimp-on center pin. Canare FP-C series or equal. Crimping and die tools shall be Canare TC-1 Hand Crimp Tool with appropriate TCD die sets or equal.

F. BNC (RGBHV Graphics): Graphics signal BNC connector shall be crimp-on type with insertion barrel and ferrule, and gold flashed crimp-on center pin. Barrel shall provide full circumferential contact with the braid. Fittings shall be sized to fit the cable. BNC manufacturer, model, and tools as recommended by the manufacturer of the RGBHV/graphics cable.

G. XLR: Strain relief shall be sized to fit the cable. Connector shell shall be isolated from all contacts. Neutrik CA-NC series or equal.

H. Mini-XLR: Strain relief shall be sized to fit the cable. Connector shell shall be isolated from all contacts. Switchcraft or equivalent.

I. Phono (RCA): Phono/RCA connectors shall have gold contact and solid center pin with metal strain relief. Canare F-10 or Canare F-09 or equal.

J. Phone (1/4 inch): Reinforced one-piece body shall have brass bar running length of handle. Canare F-15 (TS) or Canare F-16 (TRS) or equal.

K. Mini (1/8 inch): Shall be Canare F-11 (TS) or Canare F-12 (TRS) or equal.

L. RJ45: RJ45 jacks that are field-terminated shall be punch-down type. All flexible connectivity to AV devices shall be factory-molded patch cables. Where a field-terminated plug is required by manufacturer recommendations, Contractor shall use appropriate connector type to the type of cable used (solid vs. stranded).

M. Shielded cable to be terminated with shielded connectors or as required by manufacturer recommendations.

N. DM, DM8G+: Shall be Crestron shielded RJ-45 and fiber connectors, as recommended by manufacturer of DM or DM8G+ system.

O. Schedule: Contractor shall submit schedule prior to installation for Consultant review indicating connectors that will be used on the project.

2.07 INTERFACE PANELS

A. Finish: Interface plates and connector panels shall be as indicated on Drawings and as specified herein. Finish on custom wall interface plates shall match that of electrical and other work and shall be coordinated with Consultant prior to ordering. Connector panels in equipment racks shall match finish of rack frame and specified/provided blank panels unless called out otherwise in equipment schedules.

B. Floor Boxes: Floor box plates shall be provided wherever connectivity through a floor box is indicated on drawings.

C. Labels: Interface plates and connector panels shall be engraved to show connector functionality. Engravings shall be finished with a contrasting color to plate finish.

D. Connector Placement: Verify connector layout detail for custom panels

E. Box Mounts: Wall and floor interface plates shall mount to appropriate electrical conduit boxes unless indicated otherwise.

F. Cut-ins: Where no box is provided, Contractor shall cut in appropriate opening for plate and provide appropriately sized mud-ring/caddy to securely attach plate to wall.

G. Rack Blank Panels: Contractor shall provide all blank rack panels necessary to fill opening in the front of AV equipment racks, whether specified in the equipment schedules or not.

2.08 FIRE STOPPING MATERIALS

A. Refer to Section 27 00 00 for additional requirements.

PART 3 - EXECUTION

3.01 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.02 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.03 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.04 EQUIPMENT

A. As required by Section 27 00 00.

1. Safety: Contractor shall use proper structural installation techniques and maintain a minimum 5:1 safety margin.

2. Custom Mounting Finish: Custom mounting hardware shall be painted by Contractor to match either color of wall, ceiling or equipment, at Consultant’s discretion.

3.05 INTERCONNECTION

A. As required by Section 27 00 00.

1. Interpretation: Contractor shall make system interconnections as indicated on Drawings and specified herein. Contractor shall interpret Drawings using an understanding of the

equipment and general system topology (both existing and future/specified). Contractor shall provide power and control lines to and from power supplies, remotely controlled equipment, and other devices even though not explicitly indicated on Drawings or listed in equipment tables.

2. Additional: Contractor shall be responsible for associated equipment signals not specifically documented in provided drawings. These include synchronizing signals, transmitting and receiving antennas, and LAN connections to equipment provided and/or installed by Contractor and, Reference product specification.

3.06 CABLE MANAGEMENT

A. As required by Section 27 00 00.

1. Above Ceiling: Cabling located above ceilings shall be tied off to and supported by ceiling supports or other structures at a minimum of eighteen (18) inches above the ceiling.

2. Contractor must provide a cable support system secured to the building structure rigidly with allowed attachments.

3. Not on Ceiling: Cabling shall not lie on the ceiling.

4. Wall Cabling: Cables installed in a horizontal fashion along wall surfaces shall be installed in surface raceway approved by Owner and Consultant.

5. Floor Cabling: Cabling placed at floor level, such as microphones, shall be installed on the floor in the shortest possible route to the nearest wall considering traffic patterns and in an enclosure designed for that use and offering protection from foot traffic.

6. Desk Cabling: Where a cable is installed inside desk furniture, a means of protecting the cables and holding cabling to a fixed surface shall be installed.

7. Grommets: Holes in horizontal furniture surfaces for cable pass-through shall be provided with appropriate sized grommet. Grommet shall be black unless otherwise specified or required.

8. Stub-ups: Where conduit is stubbed-up through the floor and exposed, Contractor shall wrap cables with black expandable sleeving and secure at least three (3) inches below level of conduit top.

9. Where conduit is stubbed-up through floor and concealed within furniture, Contractor shall install tether comprised of aircraft cabling to limit the distance furniture may be moved away from stubbed-up conduit. Cabling service loop exiting stubbed-up conduit and entering furniture shall be longer than the corresponding tether, providing protection against movement of furniture that would otherwise damage installed cabling.

10. Umbilicals: Exposed cable umbilicals, such as those between instructional furniture and a floor- or wall-mounted plate, shall be covered in black expandable sleeving, with neatly finished ends (heat-shrink or Consultant-approved method).

3.07 CONNECTOR TERMINATION

A. As required by Section 27 00 00.

1. Video Connectors: Video connectors (BNC, RCA, and F) shall be terminated using a crimp tool or dies designed specifically for the connectors being applied.

2. XLR Connectors: Terminate XLR type connectors wired pin 2 high, pin 3 low, and pin 1 shield.

3. UTP: UTP cable shall be terminated with appropriate crimps tools or tools specified by manufacturer.

3.08 GROUNDING

A. Audiovisual equipment racks shall be grounded to the telecommunication grounding system with a minimum 6 AWG grounding cable. Refer to Section 27 00 00 for additional grounding requirements.

3.09 TESTING & INSPECTION

A. General Information: As required by Section 27 00 00.

B. Notification: Prior to start of testing, provide a list to Consultant of test equipment make, model numbers, and calibration dates that will be used.

C. Contractor shall verify that antenna panels are installed in appropriate area for extended signal. Antennas panels need to be within the correct frequency range.

D. Testing: Contractor shall perform complete testing on system before inspection. Selected systems may be retested during inspection at Owner's discretion.

E. The frequencies need to be set to the according search done in SHURE wireless frequency finder

F. Display/Output checks: Contractor shall verify that visual and audio outputs from the system are high-quality and without noticeable distortion or feedback at normal operating levels.

G. Wiring and Labeling: Contractor shall check all inputs and outputs for correct wiring and labeling.

H. Loudspeakers: Contractor shall measure the impedance of each speaker line leaving the equipment racks. For full range devices, use a frequency of 1000 Hz. For band limited devices, use a frequency appropriate for the operating range of the transducer. When documenting results, Contractor shall include the calculated impedance based on number of units on a line and the size and distance of the run. Contractor shall correct any field readings that differ more than 20% from the calculated impedance. Contractor shall use an electronic polarity checker to test each reinforcement speaker. Speakers shall have the same relative polarity.

3.10 COMPUTER GRAPHICS

A. Computer graphics shall be crisp and focused with respect to color alignment. If color alignment is not registered properly, Contractor shall identify source of problem and correct. EDID and other auto-registration features shall be set within AV equipment where required for optimal system performance.

3.11 TRAINING

A. General Information: As required by Section 27 00 00 and following section(s).

B. Coordination and Personnel: Training shall be coordinated with Owner's schedule, and Contractor personnel who provide training are subject to Owner's approval.

C. Training should include the explanation of installed items and its functions.

3.12 PROJECT CLOSEOUT

A. Completion: System shall be considered complete when all of the following has occurred:

1. Testing has been completed to the satisfaction of Owner and Consultant.
2. Punch-listed items have been addressed to the satisfaction of Owner.
3. As-built drawings and system documentation has been turned over to Owner and Consultant.
4. Complete operational training has been conducted with Owner's staff.
5. System Commissioning Process has been completed.

B. Acceptance: Contractor shall secure written Acceptance of systems in the form of authorized Owner signature on Acceptance Document. This shall constitute the Date of Acceptance.

End of Section

SECTION 27 41 00

AUDIO VISUAL SYSTEMS

PART 1 - GENERAL

1.01 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.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. The Proposer Shall:

1. Provide Equipment, Cable, and Devices described herein or depicted in the construction drawings.
2. Provide Labor and Services necessary to integrate each piece of Equipment, Cable, and Device into a fully operational system as a Turn-Key installation without additional charges to the Owner outside the contracted amount.
3. Integrate into the construction any existing or owner furnished equipment and miscellaneous hardware as may be described herein.
4. Maintain timely installations according to the project construction schedule.
5. Provide Owner Training, Record documentation, and operations manuals

C. Collectively Contractor delivered systems shall be as described herein and depicted in the construction drawings and provide for the following: Campus Multimedia Systems, as follows:

1. Classroom AV/multimedia presentation systems
2. Special space AV/multimedia presentation systems in the following spaces:
    a. Media Center (aka Library)
    b. Cafeteria w/ Gymnasium and Stage
    c. Fine Arts (Music)
3. Digital signage flat panel display locations
    a. Reception Lobby
    b. Administrative Offices
    c. Conference Rooms
    d. Cafeteria public displays

1.03 RELATED WORK

A. References to the following specific related work do not limit or release the Contractor from the responsibility of coordination with other trades or from having the necessary knowledge of other related work.

1. Work provided by Owner or Owner’s Contractors

2. Work by Division 27 Subcontractors
3. Work by Electrical Subcontractor
4. The Project Electrical Contractor will install electrical rough-in for use by the (CMS) Contractor and their devices. The (CMS) Contractor shall have the specific responsibility to fully coordinate their needs with the Electrical Contractor for their equipment AC Power, Back Box Type & Dimensions, Raceway & Pathways.
5. The (CMS) Contractor shall examine construction documents for familiarization of the provided Electrical Rough-in by the Electrical Contractor.
6. Needed Electrical back boxes, raceways, and pathways not provided by the Electrical Contractor but needed for the (CMS) scope of work shall be the responsibility of the (CMS) Contractor unless noted to the contrary

B. Section 27 00 00 – General Technology Requirements

C. Section 27 05 00 – Communications General Requirements

D. Section 27 05 23 – Pathways for Technology Systems

E. Section 27 05 26 – Grounding and Bonding for Technology Systems

F. Section 27 15 00 – Communications Horizontal Cabling

G. Section 27 16 00 – Communications Connecting Cords

H. Section 27 18 00 – Communications Labeling and Identification

I. Section 27 40 00 – AV/Multimedia General Requirements

1.04 DEFINITIONS

A. Refer to Section 27 00 00 and 27 40 00 for additional definitions.

1.05 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 and 27 40 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 and 27 40 00 for additional requirements.

1.07 SUBMITTALS

A. Refer to Section 27 00 00 and 27 40 00 for additional requirements.

1.08 PRE-INSTALLATION PROCEDURES

A. Refer to section 27 00 00 for additional requirements.

1.09 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 and 27 40 00 for additional requirements.

1.10 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 and 27 40 00 for additional requirements.

1.11 CORRECTION PERIOD

A. Refer to Section 27 00 00 and 27 40 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTION

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 GENERAL

A. The Contractor is bound by the intent of these Specifications to provide a complete and functional technology system as described herein, of high professional quality and reliability, and that meets or exceeds standards that are currently established for such systems.

B. Provide all necessary labor, materials, tools, transportation, services, ancillary items, and coordination to furnish the Owner a complete and fully functional installation as described herein.

C. The Contractor warrants that they will provide professional services, to meet or exceed performance standards and industry recommendations that relate to the scope of work under contract and that the workmen or system installers are experienced and regularly in the business of installing such systems as specified herein.

D. All work shall be in accordance with the respective drawings, written specifications, supplemental information, industry standards, manufacturer specific installation procedure, trade practice, and applicable regulatory agencies.

E. The Contractor(s) shall thoroughly familiarize themselves with complete construction documents, Proposal package information, and all necessary details of the complete set of drawings and specifications before submitting their Proposal.

F. Ancillary and Accessory Items

1. The Proposer shall provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.

2. The exclusion of / or limitation in the language used in the drawings or specifications shall not be interpreted as meaning that ancillary or accessories items of work or equipment necessary to complete or make the installed system fully functional can be omitted.

3. The mention in writing or representation by depiction materials, services, or operations within this specification document and or Proposal package is binding upon the Proposer to include and provides such items, services, and operations without additional charge to Owner. Exceptions shall be noted by the acronym (NIC) “Not in Contract” or (OFE) “Owner Furnished Equipment.” If this notation does not appear, then the Proposer shall assume the need to provide the item in question.

4. The Proposer shall receive no allowances because of omissions in work due to unfamiliarity or their misunderstanding of Proposal package.

G. Drawing Symbols

1. The project scope drawings utilize symbols and schematic block diagrams to indicate various items of work. Neither of these has any dimensional significance, nor do they delineate all items that may be required for the intended construction and installation.

2. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings and described in the written specifications. The Proposer shall not make limiting interpretation that provides for incomplete work or a non-functioning system.

H. Document Discrepancy

1. In the event of an inconsistency or discrepancy that may exist in or between parts of these Construction Documents, the following direction shall be followed and shall govern:

2. The document, section, phrase, or requirement with better quality, more stringent requirement, or greater amount or quantity of work or material shall apply and shall be expected, delivered, and used. Such work or material shall be provided by the Contractor and installed at no additional cost to the Owner.

I. Omissions

1. The omission of or express reference to any part(s) necessary for a complete and fully functional system and installation as intended shall not be construed as a release from the Proposer providing and installing such parts.

2.03 PRODUCT SPECIFICATIONS

A. General Information: As required by Sections 27 00 00 and 27 40 00.

B. Interconnections: Contractor shall be responsible for providing populated, grommeted, or blank cover plates for all wall and floor box openings intended for audiovisual systems.

C. Twisted Pair (TP) Category Cabling: Contractor shall use twisted pair Category cable as recommended by manufacturer of transmission equipment for optimal bandwidth and signal timing. Where cable type is not specified by manufacturer, Contractor shall use shielded twisted pair Category 6 cabling. Cable type shall be detailed in submittals with any deviations from manufacturer recommendations expressly noted.

D. Mounts: Contractor shall fabricate mounts for projectors, monitors, loudspeakers, cameras, etc., as necessary and shall modify standard mounts as required for optimal mounting configurations. Intended hardware shall be detailed in shop drawing submittals

2.04 MISC. PARTS & MATERIALS

A. General Information: As required by Sections 27 00 00 and 27 40 00.

B. Laptop Cables: Contractor shall provide all interconnection cables shown on the project drawings, including breakout cables for laptops. Laptop breakout cables shall have integrated audio, where applicable, and shall be equal or greater in quality to the Extron 26-490-series and Extron 26-650-series of cables. Substitutions are subject to prior Consultant approval.

C. Keys: Keys for like equipment shall be identical.

D. Wireless Transceivers: Where wireless transceivers are specified (including, but not limited to, wireless microphones, wireless assistive listening devices, etc.) Contractor shall verify frequency band range of existing Owner wireless systems.

E. Cable Sleeving:

1. Shall be black expandable sleeving, with ends neatly turned under 2”, held in place either by nylon tie-wrap or heat-shrink tubing. Tie wraps, if used, shall not deform cables within the umbilical. Cables requiring sleeving include:

a. Exposed cabling outside of wire management in console furniture.

b. Cable umbilicals connecting to or from wall, floor, or ceiling plates consisting of more than one wire.

2.05 MANUFACTURERS

A. Governing Clauses

1. It is not the intent of these specifications to limit or restrict submission of proposals for products or systems by manufacturers other than those specified.

2. The products specified are intended to establish a minimum baseline of operational, functional, and performance-based system expectations that all proposed products must meet or exceed by features, functionality, and quality.

3. The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specified system standards.

4. If the proposed system does not meet all the features or functions described herein, then the Proposer shall identify and list those exceptions in their proposal submittal by separate cover titled “System Exceptions” in red letters.

5. The Proposer shall not be automatically disqualified for not meeting one or more requirements. The Owner shall evaluate proposals on their overall value; all proposals shall be fully considered for best value.

6. Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

2.06 SOFTWARE TERMS & CONDITIONS

A. The successful Contractor providing software for this project affirms that it possesses complete and valid title and rights to furnish the said software. Further that it possesses legal right to sell, transfer, or license the software to the Owner.

B. The Successful Contractor herby agrees to protect, indemnify, and hold the Owner harmless against any and all claims, suits, or proceedings for patent, trademark, copyright, or franchise infringement arising out of, or resulting from, the installation or use of software or any part of the Contractor provided materials or equipment.

C. Provide the Owner with an installable and exact copy of each software program installed and running on any system furnished. The software delivered to the Owner shall include the source code. Additionally, provide a compiled copy that is user installable. Provide all software to the owner on a DVD, CD, Thumb-Drive or other format acceptable to the Owner.

2.07 CAMPUS MULTIMEDIA SYSTEMS (CMS)

A. General

1. The (CMS) described herein and diagrammatically shown in the construction drawings shall set minimum standards, features, and functions to be delivered. The brief descriptions below shall not be interpreted as limiting to functions and/or features of the overall expected system requirements. The Contractor shall specifically identify in their proposal in (RED) letters or yellow highlight any exceptions to features, functions, of devices that would deviate from those specified, depicted, or implied in the collective construction documents. Or any that would not be delivered by the Contractor’s proposed system or products.

2. Video Projector / Interactive Panels

3. Allowance shall be held be the General Contractor for procurement during the finish/ trim phase of the project to allow the owner time to evaluate

4. Other Locations:

    a. The Contractor shall mount the video projector / Interactive Panels using best practices.

    b. Where applicable, the Contractor shall provide a suspended ceiling mount kit with tile mounting plate with a 1-1/2” NPT column custom sized for proper projector mounting height in relation to the screen and universal projector interface bracket that is intended to work with the projector and 1-1/2 NPT column (length appropriate to prevent keystone).

    c. Where applicable, the contractor shall provide an appropriate wall-mount bracket with 1-1/2” NPT column custom sized for proper projector mounting height in relation to the screen and universal projector interface bracket that is intended to work with the projector and 1-1/2 NPT column (length appropriate to prevent keystone).

5. District will be using Interactive Panels.

    a. TWS: R1 3 gang box and 1 data drop

    b. PWS: R1 3 gang box and 1 data drop

2.08 EQUIPMENT GENERAL

A. This document sets forth the minimum Campus Multimedia System (CMS) equipment requirements. Described are both technical performance specifications along with certain desired features and functions that the Contractor must provide with their proposed system solution.

B. The Construction Drawings shall be referenced for specific devices and interconnections of said devices and, together with this written specification, form the required minimum (CMS) equipment requirements.

C. The Proposer shall provide one lump sum price for a complete turn-key-system installation per the construction documents. This lump sum price shall be inclusive of all work and material needed for fully functional systems.

D. The Proposer shall provide a lump sum price for each Alternate requested and list them separately from the base proposal lump sum price.

E. Collectively the described system forms certain desired features and functions that the Contractor shall provide with their proposed system solution.

1. The Proposer must state clearly in their proposal any exceptions to the equipment and or requirements found in the construction documents to that offered in the Contractors proposal.

2. Additionally, to exceptions, the Proposer shall list clearly any value-added features and or functions their proposed equipment may offer over and above the stated minimums.

3. (CMS) equipment provided and installed shall be as depicted or shown on the construction drawings described herein this document or, more specifically, under the System Description above.

4. The Contractor shall be aware that the construction documents in totality identifies the requirements and equipment required to deliver the desired performance, this means the

written specifications, drawings, and associated equipment list or generally known in totality as the “Construction Documents.”

5. Contractor shall also furnish any ancillary equipment, devices, cables, connectors, and hardware necessary to provide a complete and functional system.

2.09 PROVIDE AND ISNTALL

A. Provide equipment, devices, and interconnecting wires & cables as depicted in diagrams of the construction drawings and the following:

1. Schematics

2. Contractor shall provide all components, cables, and accessories necessary for a fully functional system in each AV space. Functional requirements shall be determined by referring to the schematic diagrams and other information contained in the technology detail sheets as well as the floor plans.

3. Omission of any necessary components below shall not be misconstrued as an exemption from providing said components. The AV components described below are only an indication of some of the major pieces required, not to be interpreted as a complete product schedule.

B. Typical Classroom Multimedia System

1. Provide for each typical classroom and similar spaces, for (P1 / Interactive Panels) locations as shown in the block diagram on the construction drawings, the HDBase-T HDMI extension system.

C. Projectors and Projection Screens, Interactive Panels and Mobile Carts

1. Provide projectors and screens at the locations indicated in the drawings. All projectors and screens are to be included in the scope of 27 41 00 Contractor unless noted otherwise on the projection schedule.

2. Acceptable Products:

3. Refer to projection schedule in the technology details sheets.

D. Loudspeakers

1. Provide loudspeakers at the locations indicated on the plans. Note that some loudspeakers are provided by other contractors. To determine which loudspeakers are in the 27 41 00 Contractor’s scope, refer to the loudspeaker schedule.

2. Acceptable products:

3. Refer to loudspeaker schedule in the technology detail sheets.

E. Projector mounts and Interactive Panel Mounts

1. All projectors shall be mounted according to the projection schedule and any associated details. Contractor shall furnish and install these projectors or Interactive Panels, providing all components as necessary for a complete installation.

2. Contractor shall be responsible for correctly locating mounts according to each projector’s lens geometry and the location and size of the screen, painted surface, or markerboard being projected onto. Locations indicated on plans are approximate and shall not be misconstrued as instructions for exact mounting locations.

F. Flat panel display mounts

1. Each “D#” type location has unique mounting requirements. Contractor shall submit mounting details with intended heights and equipment for each location. Refer to technology detail sheets for typical requirements at “D#” locations. Summary of typical products considered acceptable is indicated below:
2. Ceiling/pole mount
3. Chief Mfg. CMA100 ceiling plate
4. Chief Mfg. 1-1/2” NPT custom column
5. Chief Mfg. LCM single display mounting plate
6. Wall mount
7. Chief Mfg. LTTU Thinstall universal flat panel tilt display mount
8. Cantilever Mount
9. Chief Mfg. PAC526 flat panel pre-wire in-wall box with cover kit
10. Chief Mfg. TS525T Large THINSTALL Dual Swing Arm Wall Display Mount - 25" Extension universal flat panel tilt display mount

G. Digital Signage Flat Panel Display (Typical)

1. The Contractor shall provide a wall or pole mounted (depending on location) LCD Flat Panel Television Display along with associated equipment as depicted in the construction documents.
2. The LCD TV displays shall provide full 1080p resolution, 20,000 to 1 contrast ratio, 8ms or better video refresh response time, built in HDTV digital tuner (ATSC/ClearQAM), 10 watt per channel minimum amplifier with speakers, 2 minimum HDMI v 1.3 interfaces
3. Each location shall be configured as shown on the construction drawings with all equipment depicted. Typically, each location shall include:
4. Commercial LCD with LED backlight, multiple HDMI inputs, and RS-232 control.
5. (1) Chief Mfg. or equal LCD wall mounting bracket as depicted in the construction drawings by location.
6. Approved manufacturers:
    a. LG
    b. Panasonic
    c. Samsung
    d. NEC
    e. Or equal

H. Digital Signage Media Player

1. Wallboard
    a. Professional SaaS License
    b. Annual License subscription
    c. 1 License per panel for 5 years.

d. Preferred Vendor: DelCom

2. Acceptable Products:

a. The Contractor shall submit a sample “TWS” wall plate for Consultant / Owner review and approval prior to procurement. All audio video plates, such as “AV1”, “AV2”, etc… that are a part of this Section’s Scope-of-Work shall be of like material and color to that of the submitted “TWS” wall plate. The Contractor shall provide proposed nomenclature (labeling) for the plate, both method and style, along with the submittal. See construction drawings for plate details.

b. Acceptable Products:

i. RCI

ii. PanelCrafters

iii. Or approved equal

iv. Quantity (1) each (TWS) location as shown on construction drawings

I. Typical Classroom “TWS” Decora, AV1, AV2, AV3, and AV4 wall plates

1. The Contractor shall submit a sample “TWS” wall plate for Consultant / Owner review and approval prior to procurement. All audio video plates, such as “AV1”, “AV2”, etc… that are a part of this Section’s Scope-of-Work shall be of like material and color to that of the submitted “TWS” wall plate. The Contractor shall provide proposed nomenclature (labeling) for the plate, both method and style, along with the submittal. See construction drawings for plate details.

2. Acceptable Products:

a. RCI

b. PanelCrafters

c. Or approved equal

d. Quantity (1) each (TWS) location as shown on construction drawings

J. Cafeteria Video Menu Board System

1. Reference Kitchen Specifications for Details.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The Contractor's responsibilities

1. Examine all related construction documents to ensure compliance and full scope of work in project.

2. Examine and coordinate the installation schedule to comply with contracted timeline.

3. Examine the facility and construction documents to the extent necessary to plan for efficient installation strategies prior to the delivery of materials to the site or the commencement of work.

4. Failure to make the required examinations shall not result in any additional charges to the Owner.

3.02 INSTALLATION

A. Requirements and Responsibilities

1. The Contractor shall furnish, deliver, transport, erect, install, configure, and connect completely all the materials and equipment described herein, found or depicted on the construction document package and drawings. The Contractor shall supply all other incidental material required, such as interconnecting cables, connectors, and hardware, to make the work complete and leave all systems in first class operating condition.
2. Provide a complete and fully operational system complying with specified requirements ready for the Owner's use.
3. Coordinate with other trades working in the facility to provide seamless installation.
4. In the event of any conflicts, delays, or improper preparatory work by other trades or existing conditions, notify the General Contractor, Consultant, and Owner.
5. Provide cut-in boxes or approved clamping rings where back boxes are required but not provided by Electrical Contractor.
6. Coordinate their requirements for proper ground system to all equipment.
7. Coordinate and verify with the Electrical Contractor the installation of needed cable raceways
8. The Contractor shall not use any other trade's work or material for support or fastening. Example: ceiling grid support wires cannot be used to support cable hangers, etc. Any exceptions shall be noted or coordinated in writing.
9. The Contractor shall not shoot, fasten, or screw hangers to the roof deck. Any exceptions shall be noted or coordinated in writing.
10. Coordinate clearance for cable paths and coordinate clearance for access above cable tray to easily add or remove cable from the cable tray they install.
11. A Contractor installing any equipment shall be responsible for providing all interconnecting cables to and/or between same equipment that may be required to make equipment fully operational.
12. Equipment shall be fabricated with equipment mounted into racks, enclosures, and consoles and be fully wired and tested before delivery to job site.
13. With the installation of equipment and cables, consideration shall be given not only to operation efficiency but also to overall aesthetic factors to comply with industry standards and practices.
14. Construction, fabrication, installation, or delivery of materials must comply with applicable standards and practices.
15. Coordinate and field-verify the electrical rough-ins provided for their use by the Electrical Contractor.
16. Remove and replace cabling that is found to have been stretched or pulled past the recommended pulling tension during installation.
17. Install all operational software, as required by equipment, and ensure that such software is fully functional and operational. In the event of software conflicts due to upgrades, bugs, or other reasons, the Contractor shall provide solutions suitable to Owner at no additional cost.

18. The Contractor shall be responsible for coordination with Owner's staff the software configuration options of software configurable systems.

19. Provide to the Owner keys for all lockable equipment installed.

20. Provide all passwords for any system or equipment that may use or be locked with a password.

B. Procedures & Methods

1. Provide rack shelves or rack mounting ears for any equipment that is not rack mountable. All equipment installed using shelves shall be fastened to the rack shelf. If Velcro is used to fasten any equipment, the Velcro must be fastened with screws. Adhesive is not an acceptable means to fasten any equipment.

2. Supplementary equipment within equipment racks, such as special assemblies that are not rack mountable or fastened to rack shelves, shall be mounted on painted black high grade wooden boards running vertically on side rails of equipment racks. The same wooden strips shall also be used to support cable tie support bars for lacing cables to equipment.

3. Equipment shall be mounted into racks and consoles and fully wired and tested before delivery to job site.

4. Equipment and enclosures shall be mounted plumb and square in relation to the structure.

5. Devices, wire raceways, and equipment, except for portable equipment, shall be permanently attached to equipment racks or building structure and held firmly in place with screws or fasteners. Adhesives alone shall not be accepted as fasteners.

6. All equipment mounting boards in head-end rooms, MER's, electrical, or TR closets shall be painted white or black as location dictates with fire retardant paint. The mounting boards shall be made of high-grade plywood.

C. Wire and Cable Requirements

1. Provide rack shelves or rack mounting ears for any equipment that is not rack mountable. All equipment installed using shelves shall be fastened to the rack shelf. If Velcro is used to fasten any equipment, the Velcro must be fastened with screws. Adhesive is not an acceptable means to fasten any equipment.

2. Supplementary equipment within equipment racks, such as special assemblies that are not rack mountable or fastened to rack shelves, shall be mounted on painted black high grade wooden boards running vertically on side rails of equipment racks. The same wooden strips shall also be used to support cable tie support bars for lacing cables to equipment.

3. Equipment shall be mounted into racks and consoles and fully wired and tested before delivery to job site.

4. Equipment and enclosures shall be mounted plumb and square in relation to the structure.

5. Devices, wire raceways, and equipment, except for portable equipment, shall be permanently attached to equipment racks or building structure and held firmly in place with screws or fasteners. Adhesives alone shall not be accepted as fasteners.

6. All equipment mounting boards in head-end rooms, MER's, electrical, or TR closets shall be painted white or black as location dictates with fire retardant paint. The mounting boards shall be made of high-grade plywood.

D. Wire and Cable Requirements

1. Cable installation must follow related TIA/EIA standards and recommendations, including methodology as noted in TIA/EIA 569 - Part 4.6 Ceiling Pathways. Specifically including sections 4.6.1 General, 4.6.2 Design Guidelines, and 4.6.5 Cable Support.

2. All equipment rack wiring and cabling shall be neatly laced, ends dressed with heat shrink tubing, and all cables shall have service loops between the horizontal tie bar and the connection to equipment. Rack cabling shall be adequately supported with tie wraps or Velcro wire wraps and horizontal support bars to rack frame as it enters or exits the front or back of equipment.

3. There shall be no unmarked cables at any place in any part of any system this includes both in equipment racks and outside of equipment racks. Label markings codes used on cables shall correspond and be shown clearly on as built drawings.

4. All cables shall be separated into like groups according to signal or power levels and routed separately to eliminate signal contamination and cross-talk, this includes both in equipment racks and outside of equipment racks.

5. All power cables, control cables, and high-level cables shall be grouped to one side of the equipment rack, while low level cables shall be grouped to the other side.

6. All cables within equipment racks will use Velcro wire wraps to manage and bundle cables. Velcro strips will be no more than a ¼" wide.

7. All cabling located above ceilings shall be tied off to and supported by ceiling supports or other structures at a minimum of eighteen inches above the ceiling.

8. Cabling shall be placed in conduit where exposed in gym roof joist. Exposed cables shall not be allowed.

9. All AV cables and patch cords shall be black in color.

E. EQUIPMENT CABLE LABELS:

1. All cables, regardless of length, shall be marked with indelible color-coded labels that have unique identifying number that corresponds with those found on the schematic diagrams and Record drawings.

2. Labels shall be directly hot stamped or factory-stamped with closed sleeve method. Adhesive strip labels may only be used if protected by transparent heat-shrink tubing.

3. Marking codes used on cables shall correspond and be shown clearly on Record drawings.

4. Provide all proposed wording and/or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.

5. All wall plates shall be labeled with Input and Output identifications and referenced to corresponding operational software or hardware it serves.

6. All labels used must be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:

    a. Provide engraved Lamacoid labels at the front of all equipment mounted in the racks. Labels shall indicate equipment type and model number and correspond to the Record drawings for equipment identification.

    b. Mount labels on the equipment rack, not on the equipment, and attach in a neat, plumb, and permanent manner. The labels shall be placed on the equipment rack vertical frame (post). If the equipment rack vertical posts have a recessed mid-section, then match label width to fit this recessed section.

c. Labels shall be uniform in size. All adjacent labels shall be sized to match the other labels used for same purpose. Similarly, provide engraved labels of like size in other locations.

d. Provide engraved Lamacoid labels on each equipment rack rear door or console rear panel reading "No user serviceable parts. Refer service to qualified technician."

e. Embossed adhesive labels are not acceptable.

f. All label lettering shall be a minimum of .08" high. Embossed adhesive labels are not acceptable.

g. Position at the left side front top rack space of each equipment cabinet a label that states the name of system Installer with contact information and at the right side a label that states the Design Consultant with contact information.

h. Unless otherwise noted, labels on dark panels shall be black with white letters. Labels on stainless steel or brushed natural aluminum plates or light-colored panels shall be white with black lettering.

i. All wall plates shall have input and output connectors labeled in a professional and permanent manner, no hand-written labels shall be accepted.

j. Cable and Jack labels shall include room identification with unique cable number, jack location within the room, and MER or TR number.

k. The Contractor shall use actual room identifications in their labeling scheme. Contractor shall obtain written approval from the Owner for the actual room numbers and labeling scheme to be used prior to installation.

l. Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked in a manner approved by the Consultant.

m. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are purposely detailed in the construction drawings to ensure consistency and clarity. Verify markings and placement with the Consultant prior to procurement. Submit label sample layouts for Project Consultant’s review.

n. All terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled in a manner acceptable to the Consultant.

o. All labeling information shall appear on the Record drawings as device and equipment cross-reference identifier and servicing aids.

F. Connections and Connectors

1. Connections shall be made with approved connectors on cables, terminal blocks, or punch blocks. Crimp style connectors shall be made with proper crimping tool. Two-point crimps will not be accepted.

2. RF cable connectors shall be made with hex crimp.

3. Cables shall be terminated with the proper connector specifically produced for use with each type of cable.

4. Video connectors that are not of solder type (HDMI, BNC, RCA, F, etc.) shall be terminated using a crimp tool or dies designed specifically for the connectors being applied.

5. XLR type connectors shall be wired with pin 2 high, pin 3 low, and pin 1 shield.

6. Mechanical connectors must be specially made for type of cable or wire used.
7. Connector adapters will not be allowed in any part of the system.
8. Twist on connectors shall not be allowed.
9. Solder joints will be made with rosin-core solder.

G. Interconnections

1. Contractor shall make all system interconnections as necessary, as indicated on the Drawings or specified herein.
2. Contractor shall provide power and control cables to and from power supplies, remotely controlled equipment, and other devices even though such cables are not explicitly indicated on Drawings or listed in equipment tables.

H. Cable Management

1. Cabling located above ceilings shall be tied off to and supported with cable hangers fastened directly to the structure.
2. Where a cable is installed inside desk or other furniture, a means of protecting the cables and holding cabling to a fixed surface shall be provided.
3. Holes in horizontal furniture surfaces for cable pass-through shall be provided with appropriate sized grommet. Grommet shall be black unless otherwise specified.
4. Provide Service Loops with ample cable at each termination so that plates, panels, and equipment can be removed for service, re-termination, or inspection. Provide the following as a minimum:
5. Wall plate outlet box: minimum of ten (10) inches from wall surface to jack.
6. Termination panel: Six (6) inches behind termination panel from cable tie to jack.

I. Equipment Racks

1. Install all rack-mounted equipment using steel 10-32 machine screws with Phillips large oval heads or Allen head drives. Screws must have a black oxide finish and plastic cup washers to protect the equipment panel finish.
2. Provide wire and cable management at the front of equipment and wire and cable support bars at the rear of equipment. Support bars will be used to tie cables for strain relief before connection to the accompanying equipment. Provide sufficient service loops between support bars and equipment.
3. Unused open front rack spaces in equipment racks must be filled with black rack blank spacers (not vents). Equipment rack vents shall only be used at top and bottom of the rack.
4. Place all rack devices requiring adjustments, cleaning, or similar attention so that they will be accessible for such attention.
5. Equipment racks shall be positioned to permit full access for operation and service. This means clearance for door swing and service technician at both front and back of equipment rack.
6. Equipment racks and sensitive components shall be placed so that signals will not be contaminated by induced electromagnetic and electrostatic noise from other electrical devices.

7. All wire and cable to and from the equipment racks shall run across the top of the racks on a ladder cable tray mounted with standoffs from the equipment rack or hung below the ceiling.

8. As a general practice, all power cables, control cables, and high-level cables shall be grouped to one side of the equipment rack while low-level cables are on the other side.

3.03 EQUIPMENT LOCATION

A. Coordination: Where device locations are not shown on rack/console elevations and project drawings, Contractor shall coordinate with Consultant to identify desired/optimal locations.

B. Verify all wall-mounted monitor mounting heights on construction submittals.

3.04 CONSTRUCTION

A. Required typical system mockups

1. The Contractor shall build typical mockups as required and complete in detail for review by the Owner and Consultant prior to their final equipment install in the rest of the facility. Once reviewed and accepted, this mockup shall be the approved configuration model to install in the remaining locations. Mockups for this project include but are not limited to the following:

B. Special Techniques

1. Installers of infrared devices shall be aware of other infrared devices and infrared interference in the facility and take whatever precautions necessary to avoid this causing problem to other equipment operations. For example, cover all IR receiver sensors.

2. Installers of any RF devices shall be aware that RF devices may cause interference to the equipment and take whatever precautions necessary to avoid causing interference.

3.05 PROTECTION AND CLEANING

A. Equipment

1. Coordinate with other trades to provide an acceptable environment for installed equipment. For example, provide a dust free environment for VCRs, laser disk players, CD players, etc.

2. Cover installed equipment racks for protection during high dust periods.

3. Do not operate equipment with fans during high dust periods of the installation.

4. Coil and protect cabling from damage prior to termination to equipment

B. Prior to system turnover to Owner:

1. Remove all dirt and debris from equipment racks and equipment rooms.

2. Clean all equipment filters, vents, and fans.

3. Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

3.06 CLOSE OUT & QUALITY CONTROL

A. The following should be complete and in place before final system inspection & demonstration is scheduled and performed with the Owner's Consultant:

1. Provide written, detailed substantial completion reports of system testing
2. Dust, debris, solder splatter, etc. is removed
3. Cables are dressed, routed, and labeled with heat-shrink tubing over label at ends
4. Connections are confirmed consistent regarding polarity
5. Equipment operation tested and operating normally
6. Equipment software is installed and configured
7. Electronic devices are properly grounded
8. Devices requiring AC Power are Powered and from the proper circuit
9. Test each AC power receptacle for proper hot, neutral, and ground connections
10. Interconnecting patch cables and jumpers are in place
11. The system documentation is complete with "as-built" drawings available
12. To the best of the Contractor's knowledge, all contractual system specifications are fully met, in detail and intent.

3.07 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

3.08 TESTING & ADJUSTING

A. Refer to Section 27 00 00 for additional requirements.

B. The Contractor will be responsible for adjusting the installed system and notifying the Consultant when system adjustments have been completed:

1. In accordance with Construction Documents
2. As required, to provide the Owner a fully functional system at system turnover

As directed by the Consultant

C. Contractor shall check that all cables are properly labeled and secured prior to substantial completion inspection.

D. Prior to the substantial completion inspection, Contractor shall notify the Consultant that all items listed below are complete:

1. Contractor shall ensure that all standard functions of equipment are functional.
2. Contractor shall verify all input and outputs of the system for signal quality.
3. Audio: Contractor shall verify all sources are free of destructive noise (excessive noise floor, hiss, grounding interference) and that speakers function properly. The audio system shall be consistent in terms of volume and tone and shall be optimized for the space(s) served by the audio system.
4. Audio System Equalization
    a. Using a Real-Time audio frequency spectrum analyzer, such as Audio Control SA-3052 or equivalent, with both 1/3 band and narrow band display, equalize all loudspeaker systems to provide a suitable frequency response as follows:

b. Flat from 60 Hz to 2 kHz + or – 1-1/2db with a 1db per 1/3 octave roll off after 2K

c. Load and save the final normal settings in the DSP as preset one and record same settings, including system gain and amplifier level settings in the Record Project Manual

5. Video: Contractor shall verify that all EDID and EDID-D information has been configured at each video transmission and processing device. Where signal processing is present, Contractor shall optimize the video system to native resolution of display devices.

E. Notification: When above tests have been completed and system is ready for inspection, notify Consultant in writing at least seven working days prior to inspection. Include in this notice copies of all data recorded, date each test was completed, and results of each test. All test data shall be available during inspection process.

3.09 DEMONSTRATION

A. The final acceptance, with proof of performance and operational verifications for the installed Audio & Video Systems shall be the responsibility of and performed by the Contractor in the presence of the Consultant and Owner's representative.

B. Final acceptance shall be in accordance with Construction Documents, General Conditions, and Division 27 Technology General Requirements.

C. The Contractor shall notify the Consultant 10 day’s prior substantial completion and intended schedule for the final acceptance walkthrough demonstration.

D. Acceptance Testing shall include, but not be limited to, the following:

1. Demonstration of all system operations to the Consultant as the Owner’s representative.

2. A minimum of two (2) installation technicians provided by the Contractor to assist the project Consultant, as required, during final test verification and final acceptance demonstration.

3. The technicians shall be equipped to perform necessary corrections to the system. The Contractor shall provide test equipment capable of testing any and all parts of the equipment, cabling, or systems.

4. The minimum required test equipment shall include but not be limited to the following:

a. Three (3) two-way radios that covers the area of testing for communications between Contractor and Consultant

b. Multimeter for reading AC / DC Voltage, Amperage, Resistance, and continuity

c. Sound level meter calibrated in dB with A, C, and flat filters

d. Audio Tone Generator and audio signal tracer

e. Calibrated Pink Noise Generator

f. Real Time Audio Analyzer (RTA)

g. Audio acoustical pulse polarity/phase tester

h. Computer with installed device software and connecting cables, example DSP

5. The Contractor shall be responsible for equipment adjustments to ensure normal and proper operation. Owner required system adjustments will be made by the Contractor as directed by Owner or Project Consultant during final testing

6. If any portion of the system does not appear to be functioning properly during the final acceptance walkthrough, the Contractor shall do further test, along with corrective actions that may be immediately possible. If the need for further corrections or corrective actions does not resolve the issue, the demonstration, at the Consultant's discursion, shall be discontinued until the system operates properly.

7. The Contractor shall remain responsible for all equipment, labor, hardware, and documentation until Owner accepts such work or material in writing.

3.10 OWNER' TRAINING

A. Training Requirements

1. Owner Training of the completed installation is an important part of the overall success of this project, and therefore the installing Contractor shall provide comprehensive system training to the Owner as defined below and with the minimum training hours as specified.

2. Prior to scheduling or delivering Owner Training confirm the following:

   a. System record documentation must be provided for review to Owner and Consultant.

   b. System final walkthrough inspection must be completed.

   c. Training materials and program outline must be provided and approved by the Owner / Consultant.

   d. Training schedule must be coordinated with the Owner and Consultant.

3. Training is to include:

   a. Detailed training plan that meets approval by the Consultant and the Owner

   b. Practical and comprehensive operation of system

   c. Basic system troubleshooting techniques

   d. Digital Video file of each training session. Furnish two edited copies to the Owner

4. Training Hours

   a. The Owner reserves the right to establish training times, duration, and training topics within the total training time allotted. Training Session Blocks, as defined below, can, at the Owner's request, be combined in any combination.

   b. Provide each group of users, as defined below, with the minimum training hours as specified.

   c. Training time shall be defined as those hours specifically set aside for the sole purpose of training District personnel. Credited time shall not be given for time spent providing instructions to the Owner's staff for a system not completed, or that has not passed final acceptance by the Owner and Consultant, or training performed outside of the approved training plan.

   d. The Contractor shall issue a certificate of training completion to the trainees upon completion of their training. Both the trainer and trainee(s) must sign the certificate before Contractor shall receive final payment.

   e. The Contractor shall provide a minimum of (8) eight hours of Owner training. This training shall be divided into training session "Blocks" as coordinated with the Owner.

f. The first block session will consist of a two-hour training period and occur when the basic system comes on line. This training shall primarily be intended for the common system operators.

g. The second block will consist of a two-hour training period and will occur as directed by the Owner. This training session shall be structured for high-level users, for example, staff champions that will provide instruction to other users.

h. The third block will consist of a two-hour training period to assist the staff champions with training the end users. This training shall consist of a training session structured for Advanced System Configuration and Operational Knowledge needed to maintain and manage all systems. It shall include basic troubleshooting skills.

i. The fourth training session shall be structured as requested by the Owner. Unless otherwise directed, provide a minimum of four (2) two hours of special in-service training for District's maintenance personnel. This training shall cover system overview and any special maintenance requirements. The owner will designate the personnel to attend this training and the systems to be covered.

5. Training sessions shall cover, at a minimum:

   a. Basic System Configuration and Operation Knowledge

   b. Advance System Configuration and Operation Knowledge

   c. Typical system usage

   d. Typical User troubleshooting skills

   e. Service and maintenance requirements

6. The Owner reserves the right to establish training times, duration, and topics.

End of Section

SECTION 27 51 00

DISTRIBUTED COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 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.

1.02 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. Contractor to provide for the building MDF:

1. Server VE6030-1
2. Software - IP6000
3. Will need 1 VE6090 -1 IP 6k head end
4. Will need 2 VE8004BR audio gateways

C. Contractor to provide for the IDFs:

1. Will need 2 VE8004BR audio gateways for each IDF.

D. Contractor Shall:

1. Provide Equipment, Cable, and Devices described herein or depicted in the construction drawings.
2. Provide Labor and Services necessary to integrate each piece of Equipment, Cable, and Device into a fully operational system as a Turn-Key installation without additional charges to the Owner outside the contracted amount.
3. Integrate into the construction any existing or owner-furnished equipment and miscellaneous hardware as may be described herein.
4. Maintain timely installations according to the project construction schedule.
5. Provide Owner Training, Record documentation, and operations manuals.
6. The contractor shall furnish and install required number of data cable runs in the MDF and IDF rooms.
7. Provide and install a dedicated 24 port flat patch panel in the MDF and/or IDF rooms for the PA system.
8. Provide and install power supplies and battery back-up for each gateway in each MDF/IDF.

E. Collectively Contractor delivered systems shall be as described herein and depicted in the construction drawings and provide for the following:

1. Campus-wide Public-Address Communications System, with centralized master clock system and audio alert notification (bell) system as follows:
2. Minimum of Ten (10) Independent Hall audio channels (zones)

a. Zone 1 Admin-Offices

b. Zone 2 Classrooms

c. Zone 3 Cafeteria-Kitchen

d. Zone 4 Gymnasium-Athletics

e. Zone 5 Hallways-corridors

f. Zone 6 Portable Bldgs. - Spare

g. Zone 7 Outside Speakers

3. Independent audio for each audio zone

4. IP-based Web-Browser Graphical User Interface, IP Bell / Audio event scheduler, with 365-day Event Scheduling Calendar.

1.03 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 23 – Pathways for Technology Systems

D. Section 27 05 26 – Grounding and Bonding for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 11 00 – Communications Equipment Rooms

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 18 00 – Communications Labeling and Identification

J. Section 27 60 00 – Physical Security General Requirements

K. Section 27 64 00 – Video Surveillance System

L. Section 27 66 00 – Intrusion Detection System

M. Section 28 13 16 – Electronic Access Control System

1.04 DEFINITIONS

A. Refer to Section 27 00 00 for additional requirements.

1.05 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.

B. Training: Programmer shall have received manufacturer-provided and/or manufacturer approved training in the configuration of the distributed communications system(s) being provided.

C. Certification: Programmer shall hold the highest applicable manufacturer programming certification(s) offered by the manufacturer(s) of the distributed communications system(s) hardware.

D. Submittal: Certification certificate shall be submitted with distributed communications system(s) submittals.

1.07 SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.10 MOUNTING AND INSTALLATION

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association and any other codes as required by the AHJ.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply, and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Other applicable codes and standards are as follows:

1. ANSI/IEEE C2 – National Electrical Safety Code
2. NFPA 70 – National Electrical Code
3. TIA/EIA 568-C-1, 2, 3 Standards

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 GENERAL

A. Provide a complete and functional technology system as described herein, of high professional quality and reliability, and that meets or exceeds standards that are currently established for such systems.

B. Provide all necessary labor, materials, tools, transportation, services, ancillary items, and coordination to furnish the Owner a complete and fully functional installation as described herein.

C. The Contractor warrants that they will provide professional services, to meet or exceed performance standards and industry recommendations that relate to the scope of work under contract and that the workmen or system installers are experienced and regularly in the business of installing such systems as specified herein.

D. All work shall be in accordance with the respective drawings, written specifications, supplemental information, industry standards, manufacturer specific installation procedure, trade practice, and applicable regulatory agencies.

E. Ancillary and Accessory Items

1. The Contractor shall provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.

2. The exclusion of / or limitation in the language used in the drawings or specifications shall not be interpreted as meaning that ancillary or accessories items of work or equipment necessary to complete or make the installed system fully functional can be omitted.

3. The mention in writing or representation by depiction materials, services, or operations within this specification document and or Proposal package is binding upon the Proposer to include and provides such items, services, and operations without additional charge to Owner. Exceptions shall be noted by the acronym (NIC) “Not in Contract” or (OFE) “Owner Furnished Equipment.” If this notation does not appear, then the Proposer shall assume the need to provide the item in question.

F. Drawing Symbols

1. The project scope drawings utilize symbols and schematic block diagrams to indicate various items of work. Neither of these has any dimensional significance, nor do they delineate all items that may be required for the intended construction and installation.

2. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings and described in the written specifications. The Proposer shall not make limiting interpretation that provides for incomplete work or a non-functioning system.

G. Document Discrepancy

1. In the event of an inconsistency or discrepancy that may exist in or between parts of these Construction Documents, the following direction shall be followed and shall govern:

2. The document, section, phrase, or requirement with better quality, more stringent requirement, or greater amount or quantity of work or material shall apply and shall be expected, delivered, and used. Such work or material shall be provided by the Contractor and installed at no additional cost to the Owner.

H. Omissions

1. The omission of or express reference to any part(s) necessary for a complete and fully functional system and installation as intended shall not be construed as a release from the Proposer providing and installing such parts.

2.03 MANUFACTURERS

A. Governing Clauses

1. It is not the intent of these specifications to limit or restrict submission of proposals for products or systems by manufacturers other than those specified.

2. The products specified are intended to establish a minimum baseline of operational, functional, and performance-based system expectations that all proposed products must meet or exceed by features, functionality, and quality.

3. The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specified system standards.

4. If the proposed system does not meet all the features or functions described herein, then the Proposer shall identify and list those exceptions in their proposal submittal by separate cover titled “System Exceptions” in red letters.

5. The Proposer shall not be automatically disqualified for not meeting one or more requirements. The Owner shall evaluate proposals on their overall value; all proposals shall be fully considered for best value.

6. Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

B. Acceptable Manufacturers

1. Server VE6090-1
2. Software - IP6000
3. Will need VE6090-1
4. Will need VE800BR
5. VC40R-4 Back Plane Cable
6. VEWRK Wall Rack & Power Harness
7. Valcom V-LPT Line Level
8. Valcom V-9022A-2 2x2 Lay In Speaker
9. Valcom V-9852 Vandal Resistant Wall-Mount Speaker
10. Valcom V-9805 Vandal Resistant Enclosure w/ SS Faceplate
11. Valcom V-1080 Flex Horn
12. Valcom VP-6124 Power Supply
13. Valcom VP-6124-UPS Power Supply UPS
14. Valcom V-1092 Volume Control the CCS PA & Bell / Audio Event System
15. Valcom VBB-1424 Battery Box with Batteries

2.04 TERMS & CONDITIONS

A. The successful Contractor providing software for this project affirms that it possesses complete and valid title and rights to furnish the said software. Further that it possesses legal right to sell, transfer, or license the software to the Owner.

B. The Successful Contractor hereby agrees to protect, indemnify, and hold the Owner harmless against any and all claims, suits, or proceedings for patent, trademark, copyright, or franchise infringement arising out of, or resulting from, the installation or use of software or any part of the Contractor provided materials or equipment.

C. Provide the Owner with an installable and exact copy of each software program installed and running on any system furnished. The software delivered to the Owner shall include the source code. Additionally, provide a compiled copy that is user installable. Provide all software to the owner on a DVD, CD, Thumb-Drive or other format acceptable to the Owner

2.05 THE CAMPUS COMMUNICATION SYSTEM OR (CCS) SYSTEM DESCRIPTION

A. General

1. The (CCS) Campus Systems described herein and diagrammatically shown in the construction drawings shall set minimum standards, features, and functions to be delivered. The brief descriptions below shall not be interpreted as limiting to functions and/or features required. The Contractor shall specifically identify in their proposal in (RED) letters or yellow highlight any exceptions to features, functions, or devices that would deviate from those specified, depicted, or implied requirements. Or any that would not be delivered by the Contractor's proposed system or products.

B. The CCS Public Address System

1. Furnish and install a complete Central Public Address voice communications system with all wire, outlets, devices, loudspeakers, and equipment as specified herein, required for fully functional system and or shown on the drawings. The completed installation shall provide a fully operational sound and voice communications system for the Campus.

2. The system shall provide independent communications paths to all classrooms, workrooms, multi-purpose rooms, offices, and exterior speaker locations.

3. Corridor and common area loudspeakers shall be shared in a distributive topology and grouped in logical audio zones. A minimum of ten (10) Hall / Corridor zones shall be provided. Each common area, such as Library, Admin Office, Cafetorium, Band Hall, Freshman Center, PAC, etc., shall be grouped in their own independent zone.

4. The audio communications path shall be separate from voice processing system allowing simultaneous use of classroom telephone and receipt of intercom pages to the speaker without interruption.

5. If a telephone system is provided by owner, the system shall be interfaced to the telephone system allowing any telephone location, with the entry of a password, to initiate a page, call a specific room or zone, or initiate an emergency or time tone.

6. The system shall consist of:

   a. Valcom One-Way Zone Controller

   b. Classroom and Command Area Zones

   c. Power supply with Backup power and batteries

   d. Audio Amplifiers for distribute loudspeaker system

   e. Loudspeaker assemblies

   f. Wiring and all associated material and hardware necessary for a fully operational system as described herein.

7. The CCS shall provide the following communication paths and functions:

   a. Zoned Paging control to all classrooms within a designated wing and to specially identified zones.

8. The system shall use standard audio path technology for common distribution and IP distribution to each remote zone.

9. The PA shall include UPS battery backup for emergency paging and a minimum of 30+ minutes of up operational time in the event of comical power loss.

10. Local room wiring for speaker and call-in should be cabled with CommScope CS37 Cat 6 cable, terminated in a 66 block, plenum, white outer jacket.

11. Common area loudspeaker zones shall have no more than 10 loudspeakers power 1 watt speak per homerun zone and be fed with a Cat 6 twisted pair cable (based on a 400Feet Run). A max of two loudspeakers for power 3 to 5 watt speak per homerun (based on a 400Feet Run)

12. Contractor will provide appropriate termination blocks for speaker level terminations. Common areas shall have a single zone feed.

13. Classroom and Common Zone PA Loudspeakers shall be Valcom V-9022A-2. Each loudspeaker shall be capable of operating at 50mA @ -24VDC, lay-in ceiling grid 2' x 2' typical.

14. Additionally, the CCS shall provide the following special features:

    a. The system shall use standard audio path technology for common distribution and IP distribution to each remote zone.

    b. The PA shall include UPS battery backup for emergency paging and a minimum of 30+ minutes of up operational time in the event of comical power loss.

    c. Local room wiring for speaker and call-in should be cabled with CommScope CS37 Cat 6 cable, terminated in a 66 block, plenum, white outer jacket.

    d. Common area loudspeaker zones shall have no more than 10 loudspeakers power 1 watt speak per homerun zone and be fed with a Cat 6 twisted pair cable (based on a 400Feet Run). A max of two loudspeakers for power 3 to 5 watt speak per homerun (based on a 400Feet Run)

    e. Contractor will provide appropriate termination blocks for speaker level terminations. Common areas shall have a single zone feed.

    f. Classroom and Common Zone PA Loudspeakers shall be Valcom V-9022A-2. Each loudspeaker shall be capable of operating at 50mA @ -24VDC, lay-in ceiling grid 2' x 2' typical.

2.06 EQUIPMENT GENERAL

A. This document sets forth the minimum CCS equipment requirements. Described are both technical performance specifications along with certain desired features and functions that the Contractor must provide with their proposed system solution.

B. The Construction Drawings shall be referenced for specific devices and interconnections of said devices and, together with this written specification, form the required minimum (CCS) equipment requirements.

C. The Proposer shall provide one lump sum price for a complete turn-key-system installation per the construction documents. This lump sum price shall be inclusive of all work and material needed for fully functional systems.

D. The Proposer shall provide a lump sum price for each Alternate requested and list them separately from the base proposal lump sum price.

E. Collectively the described system forms certain desired features and functions that the Contractor shall provide with their proposed system solution.

1. The Proposer must state clearly in their proposal any exceptions to the equipment and or requirements found in the construction documents to that offered in the Contractors proposal.

2. Additionally, to exceptions, the Proposer shall list clearly any value-added features and or functions their proposed equipment may offer over and above the stated minimums.

3. (CCS) equipment provided and installed shall be as depicted or shown on the construction drawings described herein this document or, more specifically, under the System Description above.

4. The Contractor shall be aware that the construction documents in totality identifies the requirements and equipment required to deliver the desired performance; this means the written specifications, drawings, and associated equipment list or generally known in totality as the “Construction Documents.”

F. Proposal Equipment List

1. The Proposer shall provide, along with their Proposal Bid Form, a complete project material/equipment list for each device to be furnished. The Materials List is required to include the following completed categories the following:

a. Quantity of items provided

b. Manufacturer of item

c. Model number of item

d. Description of item

G. Contractor shall also furnish any ancillary equipment, devices, cables, connectors, and hardware necessary to provide a complete and functional system.

2.07 PROVIDE AND INSTALL

A. Campus Communications System

1. The Campus Communication System (CCS) shall provide Public Address for the Administration Office to communicate to a signal room or group of rooms, or other common area spaces within the campus. The CCS shall be as described in “The CCS Public Address System” description above. The proposing Contractor shall provide a comprehensive communication system that meets or exceeds the listed requirements. The system shall provide two-way voice communications between Administrative Areas and Classrooms / Instructional spaces throughout the facility.

a. Acceptable Products:

i. Include products by the following manufacturers, but not limited to:

a. Valcom VE6090 - 1 (UPS)

2. Provide uninterruptible power supplies as required to power the server Public Address System for announcements in the event the commercial utility power is lost. The UPS(s) shall be sized accordingly to maintain operational power to the CCS system for emergency announcements for a minimum 30 minutes without commercial power. The UPS must be Wall mountable and be capable of remote manageable by SNMP.

a. Acceptable Products:

i. Valcom Power Supply VP-6124 with auxiliary battery VP-6124-UPS and Valcom VBB-1424 Battery Box with Batteries

ii. Or approved equal

iii. As required

B. Loudspeakers

1. Provide loudspeakers at the locations indicated on the plans. Note that some loudspeakers are provided by other contractors. To determine which loudspeakers are in the 27 51 00 Contractor's scope, refer to the loudspeaker schedule.

2. Acceptable products:

a. Refer to loudspeaker schedule in the technology detail sheets.

C. Cable

1. Cable shall be provided and installed that meets manufacturer recommendations for equipment and signal types that are being transmitted. Refer to Division 27 specifications for UTP cable requirements.

2. Paging/ Intercom cable shall be CommScope Cat 6 Twisted cable. Provide plenum rated cable when required.

a. CommScope Uniprise Cat 6 (white) CS37

b. Provide a Commscope 24 port flat patch panel. Require Cat6 cable (s) shall be terminated from the network patch panel to a dedicated 24 port flat panel below audio gateways in each MDF and IDF room.

D. Cable Termination

1. Speaker to cable terminations shall be terminated with 3M Scothlok Butt Connector UR. Common area loudspeaker zones shall have no more than 15 loudspeakers per homerun zone on a 1 watt speak, and a max of two loudspeakers per homerun zone on a 3 to 5 watt speak and be fed with a CommScope Cat 6 Twisted cable.

2. Contractor will provide appropriate termination blocks for speaker level terminations. Common areas shall have a single zone feed.

a. Siemon S89 Bracket and Siemon MC4 Clear Cover and Siemon SA-100 Bridge Clips.

3. CommScope Cat 6 Twisted cable shall terminate Siemon M1-50 connecting block (M-66). At each telecom room, provide:

a. Siemon M1-50 connecting block (M-66)

b. Siemon S89 Bracket and Siemon MC4 Clear Cover and Siemon SA-100 Bridge Clips.

c. Approve equal

4. Speaker to cable terminations shall be terminated with the appropriate sized UR connectors.

a. Typical, Ideal 3M Scothlok Butt Connector UR

PART 3 - EXECUTION

3.01 EXAMINATION

A. The Contractor's responsibilities

1. Examine all related construction documents to ensure compliance of them.
2. Examine and coordinate the installation schedule to comply with contracted timeline.
3. Examine the facility and construction documents to the extent necessary to plan for efficient installation strategies prior to the delivery of materials to the site or the commencement of work.
4. Failure to make the required examinations shall not result in any additional charges to the Owner.

3.02 INSTALLATION

A. Installation Practices

1. All work shall be defect free, and the installer shall replace, at their expense, any work found to be defective.
2. Contractor is responsible for providing a complete and functional intercom and PA systems.
3. All manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by the manufacturers or as indicated in their published literature unless specifically noted herein to the contrary.
4. Contractor shall follow these standards and approved submittals for locations of power supplies. The Owner intends to limit the number and location of power supplies to facilitate more effective long-term support and maintenance of the system.

B. Workmanship

1. All cables and equipment terminating at panels frames shall be vertically straight, with no cables crossing each other, from twelve inches inside the ceiling area to the termination block.
2. All cable bundles shall be combed and bundled to accommodate individual termination block rows and panels.
3. All surface-mounted devices shall be firmly secured level and plumb
4. All rack mount equipment shall be securely installed.

C. Hardware Layout

1. Hardware positioning and layout shall be reviewed and approved by the Consultant and Owner prior to construction. The review does not exempt Contractor from meeting any of the requirements stated in this document.

D. Requirements and Responsibilities

1. The Contractor shall furnish, deliver, transport, erect, install, configure, and connect completely all the materials and equipment described herein, found or depicted on the construction document package and drawings. The Contractor shall supply all other incidental material required, such as interconnecting cables, connectors, and hardware, to make the work complete and leave all systems in first class operating condition.

2. Coordinate with other trades working in the facility to provide seamless installation.
3. In the event of any conflicts, delays, or improper preparatory work by other trades or existing conditions, notify the General Contractor, Consultant, and Owner.
4. Provide cut-in boxes or approved clamping rings where back boxes are required but not provided by Electrical Contractor.
5. The Contractor shall coordinate their requirements for proper ground system to all equipment.
6. Coordinate and verify with the Electrical Contractor the installation of needed cable raceways
7. The Contractor shall not use any other trade's work or material for support or fastening. Example: ceiling grid support wires cannot be used to support cable hangers, etc.
8. The Contractor shall not shoot, fasten, or screw hangers to the roof deck.
9. Coordinate clearance for cable paths and coordinate clearance for access above cable tray.
10. Provide all interconnecting cables to and/or between same equipment required to make equipment fully operational.
11. Provide and install a dedicated volume control unit in the nearest MDF or IDF room for each speaker wiring loop to high ceilings and outside zone speakers.
12. Equipment shall be fabricated for wall mounting, enclosures, and consoles and be fully wired and tested before delivery to job site.
13. With the installation of equipment and cables, consideration shall be given not only to operation efficiency but also to overall aesthetic factors to comply with industry standards and practices.
14. Contractor's construction, fabrication, installation, or delivery of materials must comply with applicable standards and practices.
15. Coordinate and field-verify the electrical rough-ins provided for their use by the Electrical Contractor.
16. Remove and replace cabling that is found to have been stretched or pulled past the recommended pulling tension during installation.
17. Install all operational software, as required by equipment, and ensure that such software is fully functional and operational. In the event of software conflicts due to upgrades, bugs, or other reasons, the Contractor shall provide solutions suitable to Owner at no additional cost.
18. The Contractor shall be responsible for coordination with Owner's staff the software configuration options of software configurable systems.
19. Provide to the Owner keys for all lockable equipment installed.
20. Provide all passwords for any system or equipment that may use or be locked with a password.
21. The Contractor shall provide and program the system ready for the owner's use.
22. Provide a CAT6a cable (reference cabling standards) run for each server and gateways or any other device that will required network connectivity.

23. Provide a Commscope 24 port flat patch panel.

24. Cat6A cable shall be terminated to a dedicated 24 port flat patch panel below audio gateways in each MDF and IDF room.

E. Procedures & Methods

1. Equipment shall be wall mounted, and fully wired, and tested before delivery to job site.

2. Equipment and enclosures shall be mounted plumb and square in relation to the structure.

3. Devices, wire raceways, and equipment, except for portable equipment, shall be permanently attached to equipment racks or building structure and held firmly in place with screws or fasteners. Adhesives alone shall not be accepted as fasteners.

4. All equipment mounting boards in head-end rooms, MER's, electrical, or TR closets shall be painted white or black as location dictates with fire retardant paint. The mounting boards shall be made of high-grade plywood.

5. Cable Termination

    a. Termination hardware (blocks and patch panels) positioning and layout shall be reviewed and approved by the Owner prior to construction. The review does not exempt Contractor from meeting any of the requirements stated in this document.

F. Device Cabling/Wiring Installation Practices

1. Cable installation must follow related TIA/EIA standards and recommendations, including methodology as noted in TIA/EIA 569 - Part 4.6 Ceiling Pathways. Specifically including sections 4.6.1 General, 4.6.2 Design Guidelines, and 4.6.5 Cable Support.

2. All equipment wiring and cabling shall be neatly laced, ends dressed with heat shrink tubing, and all cables shall have service loops between the horizontal tie bar and the connection to equipment. Wall cabling shall be adequately supported with tie wraps or Velcro wire wraps and horizontal support bars to rack frame as it enters or exits the front or back of equipment.

3. There shall be no unmarked cables at any place in any part of any system; this includes both ends of the cables and patches.

4. Label markings codes used on cables shall correspond and be shown clearly on as built drawings.

5. All cables shall be separated into like groups according to signal or power levels and routed separately to eliminate signal contamination and cross-talk.

6. All power cables, control cables, and high-level cables shall be grouped to one side of the equipment, while low level cables shall be grouped to the other side.

7. All cables will use Velcro wire wraps to manage and bundle cables. Velcro strips will be no more than a ¼" wide.

8. All cabling located above ceilings shall be tied off to and supported by ceiling supports or other structures at a minimum of eighteen inches above the ceiling.

9. Cabling shall be placed in conduit where exposed in gym roof joist. Exposed cables shall not be allowed.

10. All external wire and cables shall be supported at least every five feet from the structure or as required to maintain not more than 12" cable sag between supports and without over tensioning the cables. Provide j-hooks as needed where raceway is not available.

11. All cable supports system shall be secured to the building structure rigidly with threaded rods and beam clamps, and/or cables shall be secured and supported independently at both ends above suspended ceiling per NEC requirements.

12. Coordinate installation with Division 27 05 00 cabling to ensure there is at least 2-inches of physical separation between security cabling and voice/data cabling throughout cable path.

13. PA speaker cabling shall not share cable pathways with other cabling.

14. All cables, regardless of length, shall be labeled within 18" of both ends with an identifier that is keyed to the door, room, or corridor number as identified.

15. All cables shall have 6-foot service loops neatly coiled in the equipment room and on the speaker. During initial cable rough-in, this Contractor shall have sufficient slack to route anywhere within the equipment room.

16. Cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame. Cables shall be dressed in a neat and orderly fashion. Any cabling or equipment installation that is deemed unacceptable by the Owner or Consultant shall be replaced or corrected by the Contractor at no additional cost. Plastic zip ties are not allowed.

17. All cables are to run at right angles to the structure, placed above the ceiling in halls or corridors.

18. Cables shall not run above red iron joist.

19. Contractor shall make every effort to conceal wiring and other apparatus into walls, floors, and ceilings, assuming code and good engineering practice allows and suggests.

20. Contractor shall notify Owner immediately if obstruction or hazard is discovered in a pathway.

21. Cable shall be stored and handled to assure that it is not stretched, kinked, crushed, or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or recommendations. Cable shall not be installed in ambient temperatures or moisture conditions above or below the manufacturer’s rating.

22. No splices shall be installed in any UTP cable unless prior approval from Consultant is given.

23. All cables shall be terminated inside the speaker backbox with a cover plate and a Non-Metallic twin-screw clamp connector.

G. Equipment and Cable Labels:

1. All cables, regardless of length, shall be marked with indelible color-coded labels that have unique identifying number that corresponds with those found on the schematic diagrams and Record drawings.

2. Labels shall be directly hot stamped or factory-stamped with closed sleeve method. Adhesive strip labels may only be used if protected by transparent heat-shrink tubing.

3. Marking codes used on cables shall correspond and be shown clearly on Record drawings.

4. Cat 6 cable for PA must have his own pathways and cannot use the cable tray or any of the technology pathways.

5. Provide all proposed wording and/or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.

6. All wall plates shall be labeled with Input and Output identifications and referenced to corresponding operational software or hardware it serves.

7. All labels used must be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:

    a. Provide engraved Lamacoid labels at the front of all equipment. Labels shall indicate equipment type and model number and correspond to the Record drawings for equipment identification.

    b. Labels shall be uniform in size. All adjacent labels shall be sized to match the other labels used for same purpose. Similarly, provide engraved labels of like size in other locations.

    c. All label lettering shall be a minimum of .08" high.

    d. Embossed adhesive labels are not acceptable.

    e. Unless otherwise noted, labels on dark panels shall be black with white letters. Labels on stainless steel or brushed natural aluminum plates or light-colored panels shall be white with black lettering.

    f. All wall plates shall have input and output connectors labeled in a professional and permanent manner, no hand-written labels shall be accepted.

    g. Cable and Jack labels shall include room identification with unique cable number, jack location within the room, and MDF or IDF number.

    h. The Contractor shall use actual room identifications in their labeling scheme. Contractor shall obtain written approval from the Owner for the actual room numbers and labeling scheme to be used prior to installation.

    i. Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked in a manner approved by the Consultant.

    j. Custom panel nomenclature shall be engraved, etched, or screened. Markings for these items are purposely detailed in the construction drawings to ensure consistency and clarity. Verify markings and placement with the Consultant prior to procurement. Submit label sample layouts for Project Consultant’s review.

    k. All terminal blocks, wall mounted equipment, and active slots of card frame systems shall be clearly and logically labeled in a manner acceptable to the Consultant.

    l. All labeling information shall appear on the Record drawings as device and equipment cross-reference identifier and servicing aids.

H. Connections and Connectors

1. Connections shall be made with approved connectors on cables, terminal blocks, or punch blocks. Crimp style connectors shall be made with proper crimping tool. Two-point crimps will not be accepted.

2. RF cable connectors shall be made with hex crimp.

3. Cables shall be terminated with the proper connector specifically produced for use with each type of cable.

4. Video connectors that are not of solder type (HDMI, BNC, RCA, F, etc.) shall be terminated using a crimp tool or dies designed specifically for the connectors being applied.
5. XLR type connectors shall be wired with pin 2 high, pin 3 low, and pin 1 shield.
6. Mechanical connectors must be specially made for type of cable or wire used.
7. Connector adapters will not be allowed in any part of the system.
8. Twist on connectors shall not be allowed.
9. Solder joints will be made with rosin-core solder.

I. Interconnection

1. Contractor shall make all system interconnections as necessary, as indicated on the Drawings or specified herein.
2. Contractor shall provide power and control cables to and from power supplies, remotely controlled equipment, and other devices even though such cables are not explicitly indicated on Drawings or listed in equipment tables.

J. Equipment Mounting

1. Cabling located above ceilings shall be tied off to and supported with cable hangers fastened directly to the structure.

3.03 CONSTRUCTION

A. Required typical system mockups

1. The Contractor shall build typical mockups as required and complete in detail for review by the Owner and Consultant prior to their final equipment install in the rest of the facility. Once reviewed and accepted, this mockup shall be the approved configuration model to install in the remaining locations. Mockups for this project include but are not limited to the following:

B. Special Techniques

1. Installers of infrared devices shall be aware of other infrared devices and infrared interference in the facility and take whatever precautions necessary to avoid this causing problem to other equipment operations. For example, cover all IR receiver sensors.
2. Installers of any RF devices shall be aware that RF devices may cause interference to the equipment and take whatever precautions necessary to avoid causing interference.

3.04 PROTECTION AND CLEANING

A. Equipment

1. The Contractor shall coordinate with other trades to provide an acceptable environment for installed equipment. For example, provide a dust free environment for VCRs, laser disk players, CD players, etc.
2. Cover installed equipment racks for protection during high dust periods.
3. Do not operate equipment with fans during high dust periods of the installation.
4. Coil and protect cabling from damage prior to termination to equipment

B. Prior to system turnover to Owner:

1. Remove all dirt and debris from equipment racks and equipment rooms.
2. Clean all equipment filters, vents, and fans.
3. Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

3.05 CLOSE OUT & QUALITY CONTROL

A. The following shall be complete and in place before final system inspection & demonstration is scheduled and performed with the Owner's Consultant:

1. Provide written detailed completion reports of system testing
2. Dust, debris, solder splatter, etc. is removed
3. Cables are dressed, routed, and labeled with heat-shrink tubing over label at ends
4. Connections are confirmed consistent regarding polarity
5. Equipment operation tested and operating normally
6. Equipment software is installed and configured
7. Electronic devices are properly grounded
8. Devices requiring AC Power are Powered and from the proper circuit
9. Test each AC power receptacle for proper hot, neutral, and ground connections
10. Interconnecting patch cables and jumpers are in place
11. The system documentation is complete, with Record Drawings available
12. All contractual system specifications are fully met, in detail and intent.

3.06 TESTING & ADJUSTING

A. Refer to Section 27 00 00 for additional requirements.

B. The Contractor will be responsible for adjusting the installed system and notifying the Consultant when system adjustments have been completed:

1. In accordance with Construction Documents
2. As required, to provide the Owner a fully functional system at system turnover
3. As directed by the Consultant

C. Prior to energizing or testing the system, ensure the following:

1. All products are installed in a proper and safe manner per the manufacturer's instructions.
2. Dust, debris, solder, splatter, etc., is removed.
3. Cable is dressed, routed, and labeled; connections are consistent regarding polarity.
4. All products are neat, clean, and unmarred, and parts are securely attached.

D. Contractor shall ensure that each device in the system is functioning normally and in such a manner as to meet the functional and performance requirements in this specification.

E. Contractor shall be responsible for the following testing procedures:

1. Measure each area's ambient noise level during normal business operation.

2. Provide amplifier(s) and estimate speaker transformer tap values that provide acceptable performance without exceeding 80% of the amplifier's RMS power.

3. Acceptable performance is deemed to mean that a voice page or intercom call is 15 dB over the Ambient Noise level when measured at 5 feet above finished floor. Make all necessary adjustments per Owner and Consultant request.

F. Contractor shall ensure the overhead paging system voice pages are a minimum of 15 dB over the Ambient Noise Level in each area without exceeding 80% of the amplifiers' rated power.

G. Inspection: After Contractor's testing is complete and the system is properly adjusted, the Contractor shall contact the Owner to schedule a "spot test" of the system with the Owner and Consultant. Contractor shall make changes/adjustments per Owner and Consultant's request at no additional cost to Owner. These adjustments may include but not be limited to:

1. Adjusting volume control of amplifier.

2. Adjusting local volume control of individual speaker.

3. Re-tapping up to 20% of speakers at different wattage.

H. Notification: When above tests have been completed and system is ready for inspection, notify Consultant in writing at least seven working days prior to inspection. Include in this notice copies of all data recorded, date each test was completed, and results of each test. All test data shall be available during inspection process.

I. Inspection: After Contractor's testing is complete and the system is properly adjusted, the Contractor shall contact the Owner to schedule a "spot test" of the system with the Owner and Consultant. Contractor shall make changes/adjustments per Owner and Consultant's request at no additional cost to Owner. These adjustments may include but not be limited to:

1. Adjusting volume control of amplifier.

2. Adjusting local volume control of individual speaker.

3. Re-tapping up to 20% of speakers at different wattage

3.07 WARRANTY

1. Refer to Section 27 00 00 for additional requirements.

3.08 DEMONSTRATION

A. The final acceptance, with proof of performance and operational verifications for the installed shall be the responsibility of and performed by the Contractor in the presence of the Consultant and Owner's representative.

B. Final acceptance shall be in accordance with Construction Documents, General Conditions, and Division 27 Technology General Requirements.

C. The Contractor shall notify the Consultant 10 day's prior substantial completion and intended schedule for the final acceptance walkthrough demonstration.

D. Acceptance Testing shall include, but not be limited to, the following:

1. Three (3) two-way radios that covers the area of testing for communications between Contractor and Consultant

2. Multimeter for reading AC / DC Voltage, Amperage, Resistance, and continuity
3. Sound level meter calibrated in dB with A, C, and flat filters
4. Audio Tone Generator and audio signal tracer
5. Calibrated Pink Noise Generator
6. Real Time Audio Analyzer (RTA)
7. Audio acoustical pulse polarity/phase tester
8. Computer with installed device software and connecting cables, example DSP

E. The Contractor shall be responsible for equipment adjustments to ensure normal and proper operation. Owner required system adjustments will be made by the Contractor as directed by Owner or Project Consultant during final testing.

F. During the final acceptance walkthrough, the Contractor shall demonstrate operation of each major component and functional requirement as specified herein.

G. If any portion of the system does not appear to be functioning properly during the final acceptance walkthrough, the Contractor shall do further test, along with corrective actions that may be immediately possible. If the need for further corrections or corrective actions does not resolve the issue, the demonstration, at the Consultant's discursion, shall be discontinued until the system operates properly.

H. The Contractor shall remain responsible for all equipment, labor, hardware, and documentation, in part and in total, until Owner accepts such work or material in writing.

3.09 OWNER'S TRAINING

A. Refer to Section 27 00 00 for additional requirements.

B. Provide system operations, administration, and maintenance training by factory-trained personnel qualified to instruct.

C. Training Requirements

1. Owner Training of the completed installation is an important part of the overall success of this project, and therefore the installing Contractor shall provide comprehensive system training to the Owner as defined below and with the minimum training hours as specified.
2. Prior to scheduling or delivering Owner Training confirm the following:
3. System Record documentation must be provided for review to Owner and Consultant.
    a. System final walkthrough inspection must be completed.
    b. Training materials and program outline must be provided and approved by the Owner / Consultant.
    c. Training schedule must be coordinated with the Owner and Consultant.

D. Training is to include:

1. Detailed training plan that meets approval by the Consultant and the Owner
2. Practical and comprehensive operation of system
3. Basic system troubleshooting techniques

4. Digital Video file of each training session. Furnish two edited copies to the Owner

E. Training Hours

1. The Owner reserves the right to establish training times, duration, and training topics within the total training time allotted. Training Session Blocks, as defined below, can, at the Owner's request, be combined in any combination.

2. Provide each group of users, as defined below, with the minimum training hours as specified.

3. Training time shall be defined as those hours specifically set-aside for the sole purpose of training District personnel. Credited time shall not be given for time spent providing instructions to the Owner's staff for a system not completed, or that has not passed final acceptance by the Owner and Consultant, or training performed outside of the approved training plan.

4. The Contractor shall issue a certificate of training completion to the trainees upon completion of their training. Both the trainer and trainee(s) must sign the certificate before Contractor shall receive final payment.

5. The Contractor shall provide a minimum of (8) eight hours of Owner training. This training shall be divided into training session "Blocks" as coordinated with the Owner.

6. The first block session will consist of a two-hour training period and occur when the basic system comes on line. This training shall primarily be intended for the common system operators.

7. The second block will consist of a two-hour training period and will occur as directed by the Owner. This training session shall be structured for high-level users, for example, staff champions that will provide instruction to other users.

8. The third block will consist of a two-hour training period to assist the staff champions with training the end users. This training shall consist of a training session structured for Advanced System Configuration and Operational Knowledge needed to maintain and manage all systems. It shall include basic troubleshooting skills.

9. The fourth training session shall be structured as requested by the Owner. Unless otherwise directed, provide a minimum of four (2) two hours of special in-service training for District's maintenance personnel. This training shall cover system overview and any special maintenance requirements. The owner will designate the personnel to attend this training and the systems to be covered.

F. Training sessions shall cover, at a minimum:

1. Basic System Configuration and Operation Knowledge

2. Advance System Configuration and Operation Knowledge

3. Typical system usage

4. Typical User troubleshooting skills

5. Service and maintenance requirements

6. The Owner reserves the right to establish training times, duration, and topics.

3.10 FIRE STOPPING

A. Fire stopping of openings between floors, fire-rated walls, and smoke-rated walls created by others for This Contractor to pass cable through shall be the responsibility of the This

Contractor. Sealing material and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work.

B. Any openings created by or for this Contractor and left unused shall be sealed up by this Contractor.

C. This Contractor shall be responsible for creating a waterproof seal in and around any openings that This Contractor creates from the structure to the outside environment.

D. Any existing openings discovered that should be fire stopped should be brought to the attention of the Owner.

3.11 DOCUMENTATION

A. Upon completion of the installation, Contractor shall provide full documentation sets to the Consultant for approval as described in section 27 00 00 and 27 60 00. All documentation shall become the property of the Owner.

B. Documentation shall include the additional specific items detailed in the subsections below:

1. Contractor shall provide hard copy and electronic forms of the final test results.

2. Contractor shall provide a document including the following:

a. Device label/identifier

b. Location of each drop by orientation/permanent landmark in the room

c. Contractor shall provide accurate Record Construction Drawings. The drawings are to include cable routes and device locations.

3.12 FINAL ACCEPTANCE

A. In addition to closeout requirements in section 27 00 00 and 27 60 00, This Contractor shall demonstrate the following before final approval.

1. Owner training is complete.

2. Punch list items are complete.

3. Record documentation is complete and submitted to Owner/Consultant.

3.13 ANNUAL SUPPORT AGREEMENT

A. An annual support agreement (after the 1st year full of support/warranty) shall not be part of the bid. The Contractor shall work directly with the Owner at the end of the project to determine the ongoing hardware/software support. The Contractor shall send the Consultant a copy of the support agreement for review prior to finalization.

3.14 FINAL PROCEDURES

A. Perform final procedures in accordance with section 27 00 00 and 27 60 00.

End of Section

SECTION 27 53 19

CELLULAR DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This specification describes technical and performance criteria for deploying a 50 Ω Neutral-Host Distributed Antenna System (DAS) capable of supporting Wireless Service Providers (WSP). The DAS components specified in this document include: Donor Antennas, Coverage Antennas, Coax Cable, Coax Connectors, Splitters, Combiners, Couplers, Bi-Directional Amplifiers (BDA), Fiber-Optic Master Unit, and Fiber-Optic Remote Units.

1.02 SYSTEM DESCRIPTION

A. Services: Upon commissioning, the DAS shall provide coverage for the WSPs listed below on all frequencies currently being used by the designated WSPs in the given market.

1. AT&T Wireless
2. Sprint/Nextel
3. T-Mobile
4. Verizon

B. Expansion: Without replacing or adding to the Passive DAS Infrastructure, the DAS shall have expansion capabilities to support the following WSP and PSN frequencies deployed in a SISO antenna environment. Any additional Components required for system expansion shall comply with all specifications of this Section.

Service	Uplink, MHz	Downlink, MHz
Cellular	824 - 849	869 - 894
PCS	1850 - 1915	1930 - 1995
AWS	1710 - 1755	2110 - 2155
Commercial 700 Band	698 - 716,776-787	728 - 746
800 Band	806 - 824	851 - 869
900 Band	896 - 902	935 - 941
BRS/EBS	2496-2690	

C. WSP Approval: The Contractor shall propose and deploy a DAS system capable of receiving WSP Approval for interconnection to the WSPs' macro networks. As such, per the local WSP's design requirements, the DAS system should achieve dominant RF coverage over the WSPs macro network.

D. Network Management:

1. NMS: The DAS shall have a Network Management System (NMS) capable of alarm, monitor, configuration, and control of all Active Components.

2. SNMP Integration: The DAS NMS shall be capable of integration with 3rd party SNMP based NMS products for alarm purposes and provide alarming information.

1.03 ALTERNATIVES

A. No alternative component(s) shall be accepted as equal to the components and manufacturers specified in this document unless the Contractor proves that the alternative component(s) are of equal or superior specifications and quality and that they have been used in similar projects of size and complexity for no less than 3-years. The following information shall be required for each alternative component with submittal of the bid response:

1. Passive Components:

a. Product samples

b. Detailed product specifications

c. Independent test results verifying the product specifications

d. Written documentation from the manufacturer guaranteeing that the alternative component(s) shall remain available for new purchase for a period of 7-years from the date of system acceptance.

2. Active Components:

a. Hardware and software manuals

b. Detailed product specifications

c. Mean Time Between Failure (MTBF) data for each Active Component

d. Independent test results verifying the product specifications

e. Written documentation from the manufacturer guaranteeing that the alternative component(s) shall be supported for a period of 7-years from the date of system acceptance.

f. For Active Components serving the WSPs, written documentation from the WSPs that the alternative component(s) are approved for use within the WSP's network and that interconnection of the DAS to the WSP's network will not be withheld due to the alternative component being used in the DAS.

1.04 ABBREVIATIONS AND ACRONYMS

A. A. ACG: Automatic Gain Control

B. AHJ: Authority Having Jurisdiction

C. ATP: Acceptance Test Plan

D. AWS: Advanced Wireless Service

E. BDA: Bi-Direction Amplifier

F. BOM: Bill-of-Material

G. BRS: Broadband Radio Service

H. BTS: Base Transceiver Station

I. CDMA: Code Division Multiple Access

J. C/N: Carrier-to-Noise Ratio

K. CWDM: Coarse Wave Division Multiplexing

L. DAQ: Delivered Audio Quality

M. DAS: Distributed Antenna System

N. DWDM: Dense Wave Division Multiplexing

O. EBS: Educational Broadband Service

P. ESMR: Enhanced Specialized Mobile Radio

Q. FCC: Federal Communications Commission

R. GUI: Graphical User Interface

S. iDEN: Integrated Enhanced Digital Network

T. LMR: Land Mobile Radio

U. LTE: Long Term Evolution

V. MIMO: Multiple Input, Multiple Output

W. MTBF: Mean Time Between Failure

X. NFPA: National Fire Protection Association

Y. NMS: Network Management System

Z. NOC: Network Operations Center

AA. PCS: Personal Communications System

BB. RoF: Radio -over-Fiber

CC. RoHS: Restriction of Hazardous Substances

DD. RSL: Received Signal Level

EE. SISO: Single–Input, Single-Output

FF. SMR: Short Message Service

GG. SNIR: Specialized Mobile Radio

HH. SMS: Short Message Service

II. SNMP: Simple Network Management Protocol

JJ. SOW: Statement of Work

KK. VSWR: Voltage Standing Wave Radio

LL. WSP: Wireless Service Provider

1.05 DEFINITIONS

A. Acceptance: Expressed approval by the customer

B. Active: DAS components that require AC/DC power for operation

C. Carrier Approval: Expressed approval to interconnect to the WSP macro network

D. Cellular Access Unit: The Active device that allows the mobile devices to connect to the DAS network.

E. Channel: A path for an RF transmission between two points

F. Component: A main system element of the DAS

G. Contractor: The prime contractor bidding the project

H. RadioDelivered Audio Quality (DAQ): A measure of audio quality over a transmission medium used to quantify the quality of audio heard over a radio system. DAQ levels are defined by the following scale:

1. DAQ 1: Unusable. Speech present but not understandable.

2. DAQ 2: Speech understandable with considerable effort. Requires frequent repetition due to noise or distortion.

3. DAQ 3: Speech understandable with slight effort. Requires occasional repetition due to noise or distortion.

4. DAQ 3.4: Speech understandable without repetition. Some noise or distortion present.

5. DAQ 4: Speech easily understandable. Little noise or distortion.

6. DAQ 5: Perfect. No distortion or noise discernible.

I. DAS Sub-contractor: A qualified and experienced DAS integrator performing the DAS deployment for the Contractor.

J. Head-End Equipment: The equipment that accepts the RF Source and then typically attenuates, combines, filters, and converts the various RF Source signals before transmitting the RF signals to the Remote Units.

K. Passive: DAS components that do not require AC/DC power for operation

L. Remote Unit: The equipment that receives the RF signals from the Head-End Equipment and then typically filters, converts, and often amplifies the RF signal before transmitting it to the coverage antenna or Cellular Access Unit.

1.06 PERFORMANCE REQUIREMENTS

A. WSP DAS:

1. On a per channel basis, the downlink RSL for each frequency band shall meet or exceed the criteria in Table 1. To meet the WSP's dominate design requirements, the RSL criteria below may need to be increased per the results of the RF site survey.
Table 1 - System Parameters

Parameters	Unit	Lower 700 MHz, BRS/EBS	Cellular, PCS, AWS, Commercial 800/90 MHz	Public Safety 380 - 512, 700, 800 MHz
Minimum downlink receive signal level (RSL)	dBm	-77	-85	-95

2. Contractor shall state the assumed channel loading and frequency bands for the proposed WSP in-building coverage. Prior to installation, contractors shall confirm the channel loading and frequency use in the serving area and shall guarantee coverage for these channels per the criteria in Table 1.

3. The DAS shall deliver coverage per the criteria in Table 1 throughout 95% of the building. The coverage areas shall include the stairwells, elevators, basement, and garage.

4. The contractor shall explain the method used to avoid downlink and uplink interference.

1.07 ADDITIONAL REQUIREMENTS

A. WSP Approval: The Contractor shall be responsible for the WSP with information each WSP requires to approve interconnection of the DAS to the WSP's macro network.

B. Contractor shall comply with Division 27. Contractor must provide individual pathways for their own cable support system.

1.08 SUBMITTALS

A. Submittal Requirements with Bid Response:

1. Product Data: Submit manufacturer datasheets for the following components:
   a. Donor and Coverage Antenna
   b. Coaxial Cable and Connectors
   c. Splitters, Combiners and Couplers
   d. Bi-Directional Amplifiers (BDA)
   e. Head-End Equipment
   f. Remote Units
   g. Cellular Access Units

2. Shop Drawings: Submit the following items:
   a. RF link budget
   b. Overlay of system Components on floor plans
   c. Drawings for Donor Antenna and grounding
   d. Bill-of-Material (BOM)

3. Statement of Work (SOW): Submit sample SOW

4. Acceptance Test Plan (ATP): Submit sample ATP

5. Recommended Spares

6. Maintenance Service Pricing

7. Warranty Documents:
   a. Submit for all manufactured Components specified in this Section.
   b. Submit Contractor's System Warranty.

B. Submittal Requirements Prior to Start of Construction

1. Final RF link budget

2. WSP design approvals

3. Overlay of system Components on floor plans

4. Drawings for Donor Antenna and grounding

5. RF propagation modeling

6. Signal to Noise Interference Ratio (SNIR) Map

7. Bill-of-Material (BOM)

8. Maintenance Service Contract

9. Statement of Work (SOW): The contractor shall submit a SOW that has been accepted by the customer or customer's designated representative.

10. WSP Acceptance Test Plan (ATP): The contractor shall submit an ATP that has been accepted by the customer or customer's designated representative.

C. Submittal Requirements at Close Out

1. Submit as-built drawings indicating:
   a. Donor antenna, grounding, and lighting protection details
   b. Cable routing, splitters, couplers, and coverage antenna locations
   c. Active component locations, layout, and configuration

2. Test Reports:
   a. WSP DAS: Submit accepted ATP reports confirming the requirements of Section 1.07 A have been met.

3. Configurations
   a. Copies of Component configurations in electronic and hard copy formats, including log-in and password information

b. Copies of all required Component registration information

4. Field Reports: Submit sweep-testing results for all cable runs.

5. Field Reports: Submit OTDR test results for all fiber runs.

6. Operation and Maintenance Data: Submit hardware and software manuals for all Active Components.

7. Warranty Documents:
   a. Submit for all manufactured components specified in this Section.
   b. Submit Contractor's System Warranty.
   c. Submit Manufacturer's Extended Warranty

1.09 QUALITY ASSURANCE

A. Qualifications and Requirements:

1. Contractor or DAS Sub-contractor shall have a minimum of 4-years full-time experience executing DAS work of similar scope and complexity.

2. Contractor or DAS Sub-contractor shall have deployed a minimum of 1,000 DAS systems.

3. Contractor or DAS Sub-contractor shall have an existing NOC in operation with at least ten DAS systems being monitored.

4. Contractor or DAS Sub-contractor Engineers designing and commissioning the DAS must be degreed engineers or hold an FCC General Radiotelephone Operator license (GP).

5. Contractor or DAS Sub-contractor Project Managers must be PMI Certified.

6. Contractor or DAS Sub-contractor shall provide an onsite construction foreman to oversee the installation.

7. Contractor or DAS Sub-contractor shall provide a project manager to oversee the DAS deployment.

B. Certifications

1. The DAS manufacturer(s) of the active components shall maintain a formal authorized and certified value-added reseller program, which consists of routine quality audits of the participating value- added resellers. The list of authorized value-added resellers shall be published, and the Contractor or DAS Sub-contractor shall be listed in the Manufacturer's publication of value-added resellers.

2. Contractor or DAS Sub-contractor(s) shall provide manufacturer certification that their personnel have been trained on the passive and active components being installed.

3. Contractor or DAS Sub-contractor shall be an authorized and certified value-added reseller for the proposed DAS manufacturer of passive and active DAS components.

1.10 WARRANTY

A. Manufacturer Warranty:

1. Splitters, Couplers, and Coverage Antennas: 5-year limited warranty from date of system acceptance.

2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.

3. Fiber-Optic Cable: 10-year limited warranty from date of system acceptance.

4. Active Components: The earliest of 1-year limited warranty from date of system installation or 15 months from date of shipment.

B. Contractor Warranty: Contractor shall warrant the system performance as specified in Section 1.07 for 3- year.

1.11 MAINTENANCE & SUPPORT

A. The Contractor shall provide an optional annual maintenance service contract to include:

1. 24x7x365 Remote Monitoring

2. Remote Diagnostics & Repair

3. 24x7x365 Technician Dispatch (On-site within 24 hours)

4. Annual Preventive Maintenance

5. Service Provider Coordination

6. Equipment Warranty Management

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Specified Manufacturers for 50 Ohm passive DAS components:

1. CommScope/Andrew

2. Equivalent in accordance with Section 1.03

B. Specified Manufacturers for 50 Ohm Active components:

1. CommScope/Andrew

2. Corning/MobileAccess

3. SOLiD Technologies

4. Equivalent in accordance with Section 1.03Acceptable Manufacturers: As permitted in Section 1.03.

2.02 COMPONENTS

A. Omni-Directional Coverage: Omni-Directional Coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna. If UHF services are required as specified in section 1.02 A, the specifications for the Omni-Directional Coverage antenna shall be MARS MA-CQ26-1X or functional equivalent.

1. Electrical Band 1:

a. Frequency Band: 698 - 800 MHz b. VSWR: = 1.8:1
b. Gain: = 1.5 dBi
c. Maximum input power:
d. Impedance: 50 Ω
e. Beamwidth, Horizontal: 360° omnidirectional
f. Beamwidth, Vertical: 80° nominal
g. Return Loss: 10.9 dB

2. Electrical Band 2:

a. Frequency Band: 1710 - 2700 MHz and 800 - 960 MHz b. VSWR: = 1.5:1c.
b. Gain: = 1.5 dBi @ 800-960 MHz and = 5.0 dBi @ 1710 - 2700 MHz
c. Maximum input power:
d. Impedance: 50 Ω
e. Beamwidth, Horizontal: 360° omnidirectional
f. Beamwidth, Vertical: 65° nominal
g. Return Loss: = 13.9 dB

3. Mechanical:

a. Connector: 50 Ω N Type Female
b. Mounting: Thru-hole ceiling mount
c. Radome material: ABS, UV resistant
d. Pigtail cable: KSR195, plenum rated

4. Environmental

a. Application: Indoor
b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
c. Relative Humidity: Up to 100%

5. Regulatory Compliance/Certifications: RoHS 2002/95/EC

6. Approved Manufacturer: Andrew CELLMAX-D-CPUSE or equivalent, in accordance with Section 1.03

B. Directional Coverage Antennas: Directional coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna. If UHF services are required as specified in section 1.02 A, the specifications for the Omni-Directional Coverage antenna shall be MARS MA-WA46-1X or functional equivalent.

1. Electrical Band 1:

a. Frequency Band: 698 - 800 MHz
b. VSWR: = 1.8:1
c. Gain: = 5.0 dBi @ 698 - 800 MHz
d. Maximum input power: 50W
e. Impedance: 50 Ω
f. Beamwidth, Horizontal: 110° nominal
g. Polarization: Vertical
h. Return Loss: = 10.9 dB
i. Electrical Band 2:
j. Mechanical:
k. Environmental:

7. Electrical Band 2:

    a. Frequency Band: 1710 - 2700 MHz and 800 - 960 MHz b. VSWR: = 1.5:1
    b. Gain: = 5.0 dBi @ 800 - 960 MHz and = 6.0 dBi @ 2170 - 2700 MHz and = 8.0 dBi @ 1710 –
    c. 2170 MHz
    d. Maximum input power:
    e. Impedance: 50 Ω
    f. Beamwidth, Horizontal: 90° nominal
    g. Return Loss: = 13.9 dB

8. Mechanical:

    a. Connector: 50 Ω N Type Female
    b. Mounting: 4-hole wall mounting plate
    c. Radome material: ABS, UV resistant
    d. Pigtail cable: RG58, plenum rated

9. Environmental

    a. Application: Indoor
    b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
    c. Relative Humidity: Up to 100%

10. Regulatory Compliance/Certifications: RoHS 2002/95/EC

11. Approved Manufacturer: Andrew CELLMAX-D-CPUSE or equivalent, in accordance with Section 1.03

C. Air Dielectric, Plenum Rated Cable:

1. Material Characteristics:

    a. Jacket: Halogenated, Fire-Retardant
    b. Outer Conductor Material: Corrugated Aluminum or Corrugated Copper
    c. Inner Conductor Material: Copper-Clad Aluminum Wire

2. Electrical Characteristics:

d. Impedance: 50 ± 2.0 Ω
e. Frequency Band: 1 - 8800 MHz
f. Peak Power Rating: = 40.0 kW

3. Mechanical Characteristics:

g. Diameter Over Jacket: = .627 in
h. Minimum Bending Radius: = 5 in
i. One Time Minimum Bending Radius: = 3 in

4. Attenuation Characteristics: ½'' Nominal

12. Frequency (MHz)	13. Attenuation (dB/100ft)
14. 150	15. = 0.848
16. 450	17. = 1.53
18. 800	19. = 2.105
20. 2000	21. = 3.564

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Attenuation Characteristics: ½'' Nominal

22. Frequency (MHz)	23. Attenuation (dB/100ft)
24. 150	25. = 0.848
26. 450	27. = 1.53
28. 800	29. = 2.105
30. 2000	31. = 3.564

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

D. Foam Dielectric, Plenum Rated Cable:

1. Mechanical Characteristics:

a. Jacket: Non-halogenated, Fire-Retardant Ployolefin
b. Outer Conductor Material: Corrugated Copper
c. Inner Conductor Material: Copper-Clad Aluminum Wire or Copper Tube

2. Electrical Characteristics: 7/8'' Nominal:

a. Impedance: 50 ± 1.0 Ω
b. Frequency Band: 1/2" Nominal: 1 - 8800 MHz, 7/8" Nominal: 1 - 5000 MHz
c. Peak Power Rating: = 40.0 kW

3. Mechanical Characteristics:

a. Diameter Over Jacket: 1/2” Nominal: = .630 in, 7/8” Nominal: = 1.1 in
b. Minimum Bending Radius: 1/2” Nominal: = 5 in, 7/8” Nominal: = 10 in
c. One Time Minimum Bending Radius: 1/2” Nominal: = 2 in, 7/8” Nominal: = 5 in

4. Attenuation Characteristics: ½’’ Nominal

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.815
450	≤ 1.447
800	≤ 1.968
2000	≤ 3.251

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Attenuation Characteristics: ½’’ Nominal

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.417
450	≤ 0.744
800	≤ 1.014
2000	≤ 1.683

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

6. Approved Manufacturer: Andrew LDF4-50A, FXL-540-NHR, FXL-780-NHR or equivalent, in accordance with Section 1.03.

E. Splitters, Combiners, Couplers, Coax Jumpers and Connectors:

1. Approved Manufacturer: Andrew or equivalent, in accordance with Section 1.03

F. BDA: When the DAS dictates a BDA as the RF source, the BDA shall use digital filtering to mitigate interference and accommodate multiple services for WSPs

1. Characteristics:

a. Operating Temperature Range: -33 °C to +50 °C
b. Filtering: Digital for Public Safety Bands
c. Separate Control: Each RF amplifier shall be capable of adjusting and controlling power levels for each WSP when multiple WSPs share a single amplifier.
d. FCC Part 90.219 Type Classification: Class A narrowband for LMR/SMR/ESMR frequency bands
e. Alarming: Shall support both SNMP and SMS using wireless mode

2. Compliance:

a. NFPA: For Public Safety bands, the BDA shall comply with NFPA 72 In-Building Public Safety Radio Enhancement Systems.
b. FCC: Shall be FCC type certified.

3. Approved Manufacturer:

a. CommScope/Andrew
b. Axell Wireless
c. Bird Technologies
d. Equivalent in accordance with Section 1.03.

G. Fiber-Optic Master Unit: When building size dictates an Active fiber DAS, the Fiber-Optic Master Unit shall convert radio over coax to Radio-Over-Fiber (RoF) for distribution to Fiber-Optic Remote Units.

1. Approved Manufacturer:

a. CommScope/Andrew
b. Corning/MobileAccess
c. SOLiD Technologies
d. Equivalent in accordance with Section 1.03.

H. Fiber-Optic Remote Units: The Fiber-Optic Remote Unit converts the RoF signal back to radio over coax, as well as provides filtering so that multiple frequency bands can reside over the same passive cable and antenna infrastructure.

1. Approved Manufacturer:

a. CommScope/Andrew
b. MobileAccess
c. SOLiD Technologies
d. Equivalent in accordance with Section 1.03.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The contractor and/or DAS Sub-contractor shall design, install, commission, and test the DAS in accordance with the manufacturer's instructions and recommendations.

B. The contractor and/or DAS Sub-contractor shall install the DAS in accordance with the accepted SOW.

C. The contractor and/or DAS Sub-contractor shall adhere to all work and safety requirements while working at the job site.

D. The contractor and/or DAS Sub-contractor shall have DAS project foreman on site overseeing the installation.

E. The contractor and/or DAS Sub-contractor shall have, at a minimum, one PMP certified Project Manager on staff overseeing the project. The Project Manager will be responsible for the following:

a. The contractor shall coordinate with Owner/Technology Consultant for equipment placement.
b. Developing and maintaining a project plan consistent with the overall milestones of the project.
c. Overseeing and coordinating the activities of the DAS project, including initiating and holding weekly project conference calls, as well as maintaining and distributing meeting minutes.
d. Act as the point-of-contact interface for all DAS project activities.
e. Provide weekly status updates regarding work performed, worked scheduled, open items, problems/issues, and resolutions.

F. The contractor and DAS Sub-contractor shall be prepared to deploy the DAS in a phased approached as dictated by the building construction and/or work of other trades.

G. The contractor and DAS Sub-contractor shall facility WSP Approval and connection to their respective macro networks.

H. The contractor and DAS Sub-contractor shall be prepared to connect to the WSP's network(s) in a phased approached as dictated by the WSP's schedules

3.02 Acceptance Testing

Acceptance testing will be performed, confirming the requirements of Section 1.07 have been met.

I. The contractor shall complete the WSP acceptance testing per the WSP's requirements and as prescribed in the approved WSP Acceptance Test Plan (ATP) submittal.

End of Section

SECTION 27 60 00

PHYSICAL SECURITY GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. Refer to Section 27 00 00 for additional project scope information. This section describes the general product and execution requirements related to furnishing and installing Physical Security Systems. Physical Security Systems includes Video Surveillance, Electronic Access Control, Intrusion Detection, and their sub systems.

B. Contractor shall be responsible for providing complete and functional systems as described in this specification and project drawings.

C. Contractor shall provide low voltage power and control lines to and from power supplies, remotely controlled equipment, and other devices, even though not explicitly indicated on drawings or listed in equipment tables.

D. Contractor shall be, or Contractor shall provide, an Electrical Contractor for provision of high voltage power and conduits/raceway, where necessary.

E. Contractor shall be responsible for any and all related programming and end-user training unless noted otherwise.

1.02 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 05 28 – Pathways for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 11 00 – Communications Equipment Rooms

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 18 00 – Communications Labeling and Identification

J. Section 27 51 00 – Distributed Communications Systems

K. Section 27 64 00 – Video Surveillance System

L. Section 28 13 16 – Electronic Access Control System

M. Section 28 16 43 – Intrusion Detection System

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.04 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.05 QUALIFICATIONS

A. Refer to Section 27 00 00 for additional requirements.Training: Programmer shall have received manufacturer-provided and/or manufacturer approved training in the configuration of the physical security system(s) being provided.

C. Certification: Programmer shall hold the highest applicable manufacturer programming certification(s) offered by the manufacturer(s) of the physical security system(s).

D. Submittal: Certification certificate shall be submitted with physical security system(s) submittals.

1.06 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements. Hardware, Application Software, and Network Requirements: A system description including analysis and calculations used in sizing equipment required by the Physical Security Systems. The description shall show how the equipment will operate as a system to meet the performance requirements of the systems. The following information shall be supplied as a minimum:

B. Server(s) processor(s), disk space and memory size

C. Workstation(s) processor(s), disk space and memory size

D. Operating System(s) Software, where software is provided or upgraded

E. Application Software, with Optional and Custom Software Modules supplied in this project

F. Integration Schemes: Proposed connectivity, software, development requirements, and SDK information for inter-system communication.

G. Network reliability requirements

H. Number and location of LAN ports required

I. Number of IP addresses required.

J. Other specific network requirements, preferences, and constraints

K. Backup/archive system size and configuration

L. Start-up operations

M. Description of site (field) control equipment (Controllers/Field Panels) and their configuration

N. Access control power calculations.

O. Battery backup requirements

1.07 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

B. Quick-Reference Guides: Contractor shall create a concise quick-reference guide covering normal system operation and basic troubleshooting procedures for each room/system type.

Length of each quick-reference guide shall be commensurate with the information needed for successful operation, subject to Owner approval.

C. Upon Owner approval, Contractor shall provide two (2) laminated copies and one (1) digital copy for each room/system type.

D. Serial Numbers: Contractor shall provide a list of serial numbers for all supplied components with serial numbers and with a unit price greater than $99. Organize list by room/system type.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 KVM

1. This Section Not Used.

2.03 NTP TIME SERVER

A. The Contractor shall program all servers/devices to the Owner's existing NTP server. No new dedicated NTP server is required.

2.04 GROUNDING AND BONDING

A. The Contractor shall bond and ground the primary protectors and the metallic member of cable sheaths to building ground utilizing a minimum of 14-awg and no greater than 6-awg at the closest point of entrance as practical, not exceeding 50 feet, in accordance with the NEC.

2.05 Fire Stopping Materials

A. Refer to Section 27 00 00 for additional requirements.

PART 3 - EXECUTION

3.01 NETWORK TIME PROTOCOL (NTP) SYNCHRONIZATION

A. All security systems as well as additional integrated systems such as intercom/PA, SQL/database servers and data logging servers shall synchronize to a common NTP server.

B. All systems including servers and workstations shall be within 250ms of each other or less depending on specific system requirements. The synchronization frequency shall be no less than every 1 hour. The Contractor shall use software such as NetTime (www.timesynctool.com) installed on the servers and dedicated workstations.

C. The Contractor shall coordinate with the Owner for a NTP server connection address.

3.02 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.03 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

B. On-Site Training

1. General: Present, review and describe equipment and materials to the Owner and Owner's operating personnel and fully demonstrate the operation and maintenance of the systems, equipment and devices specified herein.

2. Include with new systems, Contractor to arrange and provide for video recording of each onsite training session.

    a. Provide professional video and audio recording of each software screen option with Owner approval of content.

    b. Provide end user video recording for all training levels.

    c. Training shall comprise two separate levels of training;

3. User Group upon substantial completion of the project.

    a. User group training shall include a site/building walk through indicating locations of equipment and their usage.

    b. User group training shall include the operation of workstation capability of system monitoring, command override, and report generation.

4. Maintenance Group upon completion of the project prior to close out.

    a. Maintenance group training shall include a site/building walk through indicating locations of equipment and their usage at up to six representative sites.

    b. Review of a-build documentation at each controller location.

    c. Troubleshooting techniques in hardware and software.

5. The training shall cover the overall system, each individual system, each subsystem, and each component. The training shall also cover procedures for database management, normal operations, and failure modes, with response procedures for each failure. Each procedural item shall be applied to each equipment level.

6. Duration: Refer to the individual sections for the minimum time requirements.

3.04 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

B. Furnish and guarantee maintenance, repair, and inspection service for the system using factory trained authorized representatives of the manufacturer of the equipment for a period of three years after final acceptance of the installation.

C. Third Party Device warranties are transferred from the manufacturer to the Contractor, which may then transfer third party warranties to the Owner. Specific third party warranty details, terms and conditions, remedies, and procedures, are either expressly stated on, or packaged with, or accompany such products. The warranty period may vary from product to product. These products include but are not limited to devices that are directly interconnected to the field hardware or computers and are purchased directly from the manufacturer.

D. The Contractor shall repair any system malfunction or installation deficiency discovered by the Owner or their representatives during the burn in and warranty period.

E. The Contractor shall correct any installation deficiencies found against the contract drawings and specifications discovered by the Owner or their representatives during the warranty period.

3.05 EXAMINATION OF SITE AND DOCUMENTS

A. Bidder shall examine all documents, shall visit the site(s) prior to submitting proposal, record their own investigations, and shall inform themselves of all conditions under which the Work is to be performed at the site(s) of the Work, including the structure of the ground, the obstacles that may be encountered, and all of the conditions of the documents, including superintendence of the Work, requirements of temporary environmental controls, the time of completion, list of Subcontractors, and all other relevant matters that may affect the Work or the proposal process.

B. Verify cable lengths comply with published standards.

C. Notify Owner/Consultant of installation that would exceed maximum lengths prior to installation of cable.

D. Contactor shall consult with Owner/Consultant regarding alternative routing or location of cable.

E. Do not proceed until unsatisfactory conditions have been corrected.

F. Failure to make the examination shall not result in any Change Order requests.

G. The Bidder shall base the proposal on the site(s) examination, materials complying with the plans and specifications and shall list all materials where the proposal form requires.

H. The commencement of work by the Contractor shall indicate acceptance of existing conditions unless a written notice of exceptions has been provided to the Owner/Consultant prior to commencement.

I. If the Contractor observes, during preliminary examinations or subsequent work, existing violations of fire stopping, electrical wiring, grounding, or other safety- or code-related issues, the Contractor shall report these to the Owner/Consultant in a timely manner.

3.06 SPARE PARTS

A. Licenses

B. Cameras

C. Card Readers

3.07 INSTALLATION REQUIREMENTS

A. Refer to Section 27 00 00 for additional requirements.

B. Contractor shall furnish and install all cables, connectors, and equipment as shown on Drawings and as specified herein.

C. It is the Contractor’s responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.

D. Beginning installation means Contractor accepts existing conditions.

E. The Contractor shall be responsible for identifying and reporting to the General Contractor any existing damage to walls, flooring, tiles, and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway, or other hardware shall be repaired by the Contractor.

F. Repairs shall match preexisting color and finish of walls, floors, and ceilings. Any Contractor-damaged ceiling tiles, floor, and carpet shall to be replaced to match color, size, style, and texture.

G. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

H. All wiring shall be run “free-air,” in conduit, in a secured plastic raceway or in modular furniture as designated on the Drawings. All cable shall be free of tension at both ends. PLENUM rated cable shall be used in areas used for air handling.

I. Avoid abrasion and other damage to cables during installation.

J. The cable system will be tested and documented upon completion of the installation as defined in the section below.

K. All manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by manufacturers or as indicated in their published literature, unless specifically noted herein to the contrary.

3.08 COOPERATION

A. The Contractor shall cooperate with Consultant’s and Owner’s personnel in locating work in a proper manner.

B. Should it be necessary to raise, lower, or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

3.09 COMMISSIONING SUBMITTALS

A. Provide the following to the Owner no later than 30 days prior to system commissioning/programming.

1. Commissioning Test Plan and Check-Off List: Specified elsewhere in this document.

2. Software: One set of fully functional software in manufacturer’s original media packaging, temporarily licensed for a 30-day evaluation period.

3. Web-based Training: Access to web-based training modules.

3.10 COMMISSIONING

A. Provide programming and commissioning for each system as described in individual sections below.

B. This Contractor shall develop and submit a plan for coordination of settings and programming issues with the Consultant and Owner no later than 30 days prior to performing programming and commissioning.

C. The security Contractor is required to place entire system into full and proper operation as designed and specified.

D. Verify that all hardware components are properly installed, connected, communicating, and operating correctly.

E. Verify that all system software is installed, configured, and complies with specified functional requirements.

F. Perform final acceptance testing in the presence of Owner's representative, executing a point-by-point inspection against a documented test plan that demonstrates compliance with system requirements as designed and specified.

1. Submit documented test plan to Owner at least 14 days in advance of acceptance test, inspection, and check-off.

2. Conduct final acceptance tests in presence of Owner's representative, verifying that each device point and sequence is operating correctly and properly reporting back to control panel and control center.

3. Acceptance by Owner is contingent on successful completion of check-off; if check-off is not completed due to additional work required, re-schedule and perform complete check-off until complete in one pass, unless portions of system can be verified as not adversely affected by additional work.

4. The system shall not be considered accepted until all acceptance test items have been successfully checked-off. Beneficial use of part or all of the system shall not be considered as acceptance.

3.11 OPERATION AND MAINTENANCE MANUALS

A. Part One: Notwithstanding requirements specified elsewhere, submit the following labeled as the "Operating and Maintenance Manual" within thirty (30) days after Final Acceptance of the Installation:

1. Record Drawings: Submit two (2) copies of revised versions of drawings as submitted in the "Shop and Field" and "Equipment Wiring Diagrams" Submittals showing actual device locations, conduit routing, wiring and relationships as they were constructed. Include nomenclature showing as-built wire designations and colors. Drawings shall include room numbers coinciding with Owner space planning numbering. Drawings shall be submitted in electronic editable AutoCAD 2010 files, in ".dwg" format, on CD or DVD disks.

2. Manuals: Submit two (2) copies of each of the following materials in bound manuals, or electronic PDF copies, with labeled dividers:

a. A final Bill of Material for each system

b. Equipment Instruction Manuals: Complete, project specific comprehensive instructions for the operation of devices and equipment provided as part of this work.

c. Manufacturers Instruction Manuals: Specification sheets, brochures, Operation Manuals and service sheets published by the manufacturers of the components, devices and equipment provided.

d. Include information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.

e. Provide a replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.

f. Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.

g. Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturer's Warranty Registration papers as described herein.

B. Part Two: Within fourteen (14) days of receipt of Consultant reviewed Operating and Maintenance Manual (Phase One), submit three (3) electronic copies in AutoCAD 2010 editable .dwg format of the reviewed Record Drawings and three (3) copies of the reviewed Operating and Maintenance Manuals to the Owner, on CD or DVD disks.

1. Within each equipment enclosure and/or terminal cabinet, the Contractor shall place a Single Line drawing of the system(s) and the respective Terminal Cabinet Wiring Diagram in a clear plastic sleeve permanently attached to the inside cover of the terminal cabinet.

2. In each equipment enclosure the Contractor shall place a drawing providing device locations served by the equipment within the enclosure with identification that is identical to the wiring tags and with the software description of each point.

3. The Contractor shall provide to the Owner one (1) copy of new administration and user software, including required graphical maps, on CD or DVD disks.

C. Sufficient information, (detailed schematics of subsystems, assemblies and subassemblies to component level) clearly presented, shall be included to determine compliance with drawings and specifications.

3.12 CLOSEOUT PROCEDURES

A. Notification: Contractor shall provide written notification to Architect/Consultant and Owner when Contractor is satisfied that the work has been completed and is ready for inspection.

B. Closeout Submittals: Contractor shall provide closeout documentation to the Architect/Consultant. The Architect/Consultant shall receive the closeout submittals no less than 72 hours prior to the scheduled inspection time.

C. Inspection: Contractor shall be present for the inspection by the Architect/Consultant. Contractor shall supply all testing equipment needed to verify compliance with the specifications found in Bid package.

D. Punch List: Work or materials found to be incomplete, of unsatisfactory quality, failing to meet the specifications in the Bid package, and/or unacceptable to the Architect/Consultant shall be documented by the Architect/Consultant and provided to Contractor to rectify.

E. Re-Inspection: If a re-inspection is necessary, the costs of the Architect/Consultant's additional travel, hours, and expenses may be deducted by the Owner from the contract amount due Contractor.

F. Punch List Approval: The punch list shall be considered complete only after having been signed by the Owner and Architect/Consultant.

G. The system has successfully completed a 30-day performance period.

H. Payment Authorization: Final payment will be authorized only after all closeout procedures and requirements have been followed and fulfilled by Contractor and approved in writing by the Owner and Architect/Consultant, including punch list(s) and/or re-inspection(s).

3.13 SERVICE CONTRACT

A. The service contract shall cover equipment and software related to this contract, and shall provide for the following parts and services, without additional cost to the Owner:

1. Bi-yearly inspections, preventative maintenance and testing of equipment and components in Year One of the warranty period.

2. Annual inspections, preventive maintenance, and testing of equipment and components in Years Two and above of the warranty period.

3. Regular Service, Emergency Service, and Call-Back Service

4. Labor and Repairs

5. Equipment, and Materials and transportation cost.

B. Response Time: Response time for service calls.

1. Emergency service calls where system is not responding to staff directed commands through the computer systems shall be within 2 hours to the project site.

2. Emergency service calls where controllers are not reporting shall be within 2 hours to the project site.

3. Normal service calls for device malfunctions shall be within 24 hours during normal working hours to the site.

C. Repair Time: Contractor shall stock parts in sufficient quantities such that repair or replacement shall be guaranteed within 12-hours. Temporary replacements within this time period shall be acceptable, provided temporary replacements do not compromise system functionality, and provided permanent replacement is achieved within 72 hours. Contractor may contact Owner representative for use of Owner supplied spare parts where delay of system repair will have negative impact on system performance.

D. Commencement: The warranty begins at the time of issuance of the statement of "Final Acceptance of the Installation" by the Owner.

E. Transferability: The warranty shall be transferable to any person or persons at the discretion of the Owner.

F. Transmittal: A copy of this Warranty shall be delivered to, and signed for by the Owner's representative whose primary responsibility is the operation and care of these systems. A copy of the signed Warranty document shall be delivered for review as part of the Final Submittals.

G. Registration: Register Warranty papers for all equipment and software in the name of the Owner. Furnish reproductions of all equipment Warranty papers to the Owner with the Final Submittals.

H. Subcontracting: Warranty service work may not be subcontracted except with specific permission and approval by the Owner.

I. Resolution of Conflicts

1. The Owner retains the right to resolve unsatisfactory warranty service performance at any time by declaring the work unsatisfactory, stating specific areas of dissatisfaction in writing.

2. If the Contractor or his approved Subcontractor does not resolve such stated areas of dissatisfaction within thirty (30) days, the Owner may appoint any alternative service agency or person to fulfill the terms of the Warranty; the cost of which shall be borne by the Contractor. This action may be taken repeatedly until the Owner is satisfied that Warranty service performance is satisfactory. Satisfactory resolution of a malfunction shall be considered adequate when the device, equipment, system or component which is chronically malfunctioning is brought into compliance with the standards of performance as contained herein and published by the manufacturers of the equipment installed.

End of Section

SECTION 27 64 00

VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. Contractor to provide one (1) camera license per camera installed as part of this project.

C. Turn-key solution. Storage and server are part of district VM environment, and no hardware is needed.

D. Obtain, read, and comply with General Conditions and applicable sub-sections of the contract specifications. Where a discrepancy may exist between any applicable sub-section and directions as contained herein, this section shall govern.

1.02 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 05 28 – Pathways for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 11 00 – Communications Equipment Rooms

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 18 00 – Communications Labeling and Identification

J. Section 27 51 00 – Distributed Communications Systems

K. Section 27 60 00 – Physical Security General Requirements

L. Section 28 13 16 – Electronic Access Control System

M. Section 28 16 43 – Intrusion Detection System

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.04 REFERENCE STANDARDS AND CODES

A. Refer to Section 27 00 00 for additional requirements.

1.05 QUALIFICATIONS

A. The Contractor shall be Unified Elite Certified by Genetec.

B. The contractor shall have a minimum of three (3) certified technicians and shall have a minimum of five (5) years experience designing and selling systems of comparable size and scope.

C. Refer to Section 27 00 00 for additional requirements.

1.06 PRE-CONSTRUCTION SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.07 PRE-INSTALLATION PROCEDURES

A. For in-use, existing facilities or retrofit projects, the Contractor shall assign all applicable electronics IP addresses and secure passwords prior to being delivered to the project or installed. Confirm password with Owner and Consultant prior to setting them.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.10 GENERAL SUMMARY

A. System shall include IP cameras and a server based NVR with client stations and storage as described in this section and on the drawings.

B. The Category 6 cabling to each camera shall be Blue, provided by the cabling Contractor. Patch cords for the IP cameras to the network switches and the cameras shall be furnished and installed by this Contractor.

C. System installation shall include, but not be limited to, installation, programming, and configuration of system components as well as all associated software upgrades, patches, and maintenance for the first year.

D. Contractor is responsible for meeting with Owner’s representative at time of camera installation to verify exact placement and view of each camera to ensure coverage area is as intended.

E. Before camera installation, Contractor to walk site with Consultant and Owner to verify camera locations and quantities.

1.11 DRAWING SHEETS

A. All cameras are designated with a C symbol on the project drawings. PTZ (Pan Tilt Zoom) cameras are designated with PTZ text next to the C symbol. Each camera has a corresponding label of the format “*##.”

B. New cameras and Category 6 cabling shall be provided at each location as specified on the camera schedule.

C. New cameras and Category 6 cabling shall be provided to replace existing cameras and coaxial cable at each location as specified on the camera schedule. Rough-ins are to be reused whenever possible.

D. Existing cameras and cabling shall be demolished at each location as specified on the camera schedule. In these cases, the Contractor shall patch and paint the holes in drywall or replace the ceiling tile. Ceiling tiles will be provided by the Owner.

1.12 MOUNTING AND INSTALLATION

A. Contractor shall provide the appropriate mounting hardware for all ceiling types and wall types where cameras shall be located. Plastic anchors are not allowed.

B. Wall mounted 180/360 degree or multi-sensor cameras shall be mounted horizontally on a wall arm, gooseneck, parapet, pendant or other similar method.

C. Exterior cameras shall be mounted on a wall arm/gooseneck.

D. Cameras mounted in droptile shall have a tile support bridge with a steel support cable connected to structure to prevent tile sagging, theft and vandalism. Utilizing toggle bolts or other screw in anchors is not allowed.

E. Interior and Exterior security cameras mounting height is 9ft – 12 ft.

1.13 CODE AND STANDARD REQUIREMENTS

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association and any other codes as required by the AHJ.

B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. Cameras shall meet the following standards:

1. MPEG-4:
    a. ISO/IEC 23008-2 (H.265)
2. Networking:
    a. IEEE 802.3af (Power over Ethernet)
3. Network Video:
    a. ONVIF Profile S or better

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 VMS GENERAL REQUIREMENTS

A. The VMS shall be an existing system utilizing a server/client model and be based on a true open architecture that shall allow for use of non-proprietary workstation and server hardware, non-proprietary network infrastructure, and non-proprietary storage. Contractor shall be responsible for licensing, programming, as well as warranty for portions of the system added/changed as part of this project.

B. The VMS shall support video encoded in MPEG-4, MPEG-2, MJPEG, H.264, H.265/HEVC, and Wavelet compression formats.

C. The VMS shall support audio encoded in g711 (u-law), g721, g723, or AAC compression formats.

D. The VMS shall support and be configured for multicast. Coordinate with the Owner on multicast network requirements.

E. The VMS shall be capable of supporting failover and standby functionality.

F. The VMS shall be licensed for active directory. (minimum 1) preferable 2

G. The VMS shall synchronize to a common NTP server as the cameras and other security systems.

H. The system shall log all actions on a per user basis, all alarms and notifications on a per device basis, and all errors and failures on a per device basis. These logs shall have the ability to be extracted to a document that can be emailed to an administrator.

I. The system shall support custom rules and actions.

J. The VMS shall be provided with mapping features. The Contractor shall acquire drawings from the Consultant to utilize for the mapping.

K. The VMS shall fully support H.264 and H.265/HEVC Smart Coding with dynamic GOP and Dynamic Frame Rate.

L. The VMS shall support full API level integration with all cameras utilized. Integrating via ONVIF is not acceptable.

M. The VMS shall have native API level support for fisheye cameras and client side dewarping. The VMS shall not utilize the video stream to detect a fisheye camera.

N. The system shall log all actions on a per user basis, all alarms and notifications on a per device basis, and all errors and failures on a per device basis. These logs shall have the ability to be extracted to a document that can be emailed to an administrator.

O. The VMS shall be provided with a 5-year software maintenance service agreement to last through the duration of the project. The Owner shall be able to receive all major and minor software updates at no additional cost for the duration of the project. At the completion of the project, the Owner shall have the option to receive a final software update to the latest version before the project is paid in full.

P. Video Management server(s) should be configured into a virtual environment. Owner prefers a centralized VM Ware solution with centralized storage/archiving space on a SAN/NAS.

Q. Manufacturer:

1. Genetec Omnicast

2.03 VMS DIRECTORY MANAGEMENT SOFTWARE

A. The server software shall launch automatically when operating system is booted and run in the background, regardless if a user is logged on.

B. The VMS shall include Microsoft Active Directory integration. The Contractor shall coordinate with the Owner on permissions, roles, and integration.

C. The directory management server shall be compatible with Microsoft Windows Server Standard.

D. The database server shall be compatible with Microsoft SQL Server 2019 or above.

E. The VMS Directory Management server shall be compatible with virtual environments, including VMware.

F. The VMS shall support the concept of Federation, whereby multiple independent VMS installations can be merged into a single large virtual system for centralized monitoring, reporting, and alarm management.

G. The administrator shall be able to perform the following actions from the interface:

1. Manage the system licenses.

2. Configure the database and database server

3. Manually back up the databases, restore the server databases, and configure scheduled backups of the databases.

4. Define the client-to-server communications security settings.

5. Configure the network communications hardware, including connection addresses and ports.

6. Configure mail server SMTP settings and port. The Contractor shall coordinate with the Owner on email accounts to be added.

7. Configure event and alarm history storage options.

H. The software shall support the configuration and management of users and user groups. An administrator shall be able to add, delete, or modify a user or user group.

I. The software shall support partitions and limit what users can view in the configuration database. The administrator shall be allowed to segment a system into multiple security partitions. The Contractor shall coordinate with the Owner on required partitions.

1. A user who is given access to a specific partition shall only be able to view component within that partition.

2. A user or user group can be assigned administrator rights over the partition.

3. It shall be possible to specify user and user group privileges on a per partition basis.

J. The software shall send an email notifying the administrator of a problem. The Contractor shall coordinate with the Owner on desired notifications and configure the system.

2.04 VMS ARCHIVER RECORDING SOFTWARE

A. The Archiver Recording Server shall be an existing system in the Owner’s VM environment. Contractor shall configure/program as required for additional cameras and licenses that will be installed as part of this project.

2.05 VMS Directory Management Server Failover Requirements

A. This project requires failover and standby Directory Management Servers. Failover for the system shall be in place and properly configured. Contractor to ensure that failover continues to work as designed, and the at new cameras, VMSs etc. are included into the existing failover system.

2.06 VMS ARCHIVER RECORDING SERVER FAILOVER REQUIREMENTS

A. This project requires failover Archiver Recording Servers and all cameras/devices associated with them. Failover for the system shall be in place and properly configured. Contractor to ensure that failover continues to work as designed, and that new cameras, VMs, etc. are included into the existing failover system.

B. The Contractor shall provide all software and licenses required for failover expansion.

C. The failover Archiver Recording Servers shall failover in a cascading fashion. For example, server A will failover to server B which will failover to server C, which will failover to server D, with the last server failover to the first server. No server shall sit idle. The servers shall not operate over a 50% capacity, so it can take on the full load from a failed server.

D. Upon restoration of a failover, the databases and video shall resynchronize automatically.

E. Redundancy shall be configured on a camera by camera basis. The Contractor shall work with the Owner to determine critical and non-critical cameras to determine which cameras failover.

2.07 SOFTWARE MAINTENANCE

A. The system shall be provided with a 5-year software maintenance agreement. The Owner shall be able to receive all major and minor software updates at no additional cost for the duration of the project. At the completion of the project the Owner shall have the option to receive a final software upgrade to the latest version (including all devices) before the project is paid in full.

2.08 VMS CLIENT SOFTWARE

A. Logging into the client software shall be done via Microsoft Active directory and enables features based on user roles and privileges.

B. The look and feel of the interface shall be customizable on a per user basis and enabled on log-in.

C. The software shall include a reporting interface to view historical events based on activity. The user shall be able to perform actions such as generating and printing a report and troubleshooting a specific event from the reporting view. The user shall be able view audit trails that show a history of user and administrator changes.

D. The software shall support graphical maps with multiple hierarchies to facilitate navigation within and between various sites and buildings. The Contractor shall set up these maps to include all cameras and integrated devices like access control, intercom and intrusion detection.

E. The operator shall be able to bookmark multiple cameras and create an incident report with the associated cameras and integrated devices attached. The bookmarks shall be protected from overwriting until the user manually deletes them. The bookmarks shall be ab le to be moved to a separate storage drive for long term archiving. The user shall be able to pull up a list of all bookmarks saved for easy management of them.

F. The software shall be able to export multiple video clips to a single file system with a self-contained player. These clips shall include the option to be encrypted. The self-contained player shall support multiple and selectable video tiles with the ability to digitally zoom. The user shall be able to build an incident by placing additional video clips into this file system for convenient storage.

G. The software shall support the following additional minimum capabilities:

1. Monitoring the events from a live security system.
2. Monitoring and acknowledging alarms.
3. Creating and editing incidents and generating incident reports.
4. Executing actions from a dynamic graphical map and floor plan.
5. Management and execution of hot actions and macros.
6. Customizable display tiles with drag and drop capabilities.
7. The software shall support a minimum of 6 active displays.
8. Intercom with duplex audio through integrated intercom system or camera equipped with or connected to a microphone and speaker.
9. Control of physical and virtual PTZ cameras with mouse control or PTZ joystick/keyboard control.
10. Client side dewarping of ImmerVision 360 enabled cameras with multiple view areas and virtual PTZ control.
11. Display all cameras from associated with the system and federated systems.
12. Create snapshots from live or recorded video. These snapshots shall be automatically saved to a snapshot folder.
13. Link cameras in live and recorded views for seamless tracking of a subject throughout a facility. The Contractor shall configure the links for all cameras within and outside of the facility.

H. The Contractor shall provide, install and configure client software on the following computers. The Contractor shall coordinate with the Owners to determine viewing privileges. The Contractor shall provide the Owner with recommended workstation/laptop performance levels early in the project so they may evaluate if hardware updates are required to their existing workstations.

I. The system shall be capable of a minimum of 99 concurrent users.

2.09 VMS WEB CLIENT

A. The web client shall be a true thin client with no download required other than web browser plug-ins.

B. The Contractor shall provide any mobile web servers and licenses required to support this functionality.

C. The web client shall support the latest versions of the following browsers:

1. Microsoft Edge
2. Google Chrome
3. Mozilla Firefox
4. Apple Safari

D. The web client shall support Microsoft Active Directory integration.

E. The web client shall support the minimum following functionalities:

1. Live and recorded video playback.
2. Video export.
3. Multiple video tiles.
4. PTZ mouse controls.

F. The system shall be capable of a minimum of 2500 concurrent web users.

2.10 VMS MOBILE CLIENT APP

A. The Contractor shall provide any mobile web servers and licenses required to support this functionality.

B. The mobile client shall support the following operating systems:

1. Apple iOS
2. Google Android

C. The mobile client shall support the following minimum functionalities:

1. Live video monitoring with a minimum of 4 video tiles.
2. Dynamic resolution.
3. Receive mobile push alarm notifications, view and acknowledge alarms.
4. PTZ control with finger.
5. Save snapshots.
6. Video streaming push back to VMS recording server.

D. The Contractor shall provide, install and configure mobile client software apps on up to 1500 mobile devices of the Owners choosing.

E. The system shall be capable of a minimum of 1500 concurrent mobile users.

2.11 VMS SYSTEM AVAILABILITY MONITOR

A. The Contractor shall provide, install and configure health monitoring software to be installed on each server running the VMS or a service required for the VMS operation.

B. The Server Monitoring Service shall be a Windows service that automatically launches at system startup, irrespective of whether a user is logged in not.

C. The health monitoring software should be installed on a server that is not the directory server.

D. The health monitoring service shall notify the system administrators of any problem or maintenance required.

E. The health monitoring service shall upload data to the cloud for monitoring and historical data.

2.12 VMS UPDATE SERVICE

A. The Contractor shall provide, install and configure a live update service tool which monitors all servers and workstations for software updates.

B. The Owner shall be able to update all system components to the latest version from this update service.

2.13 MAPPING SOFTWARE

A. The VMS software shall be provided with native integrated mapping software.

B. The Contractor shall provide a satellite level screen shot map showing exterior devices. These maps shall include drill down links to access the building floor plans where all interior and exterior devices are shown. The overview satellite map shall show alarms signifying there is an alarm in the building to draw attention quickly to the correct building then floor plan.

C. The mapping software shall be licensed to use Microsoft Bing maps, Google Maps or similar.

D. The maps shall have links to the other levels/sections as well as the global map.

E. All cameras shall show their approximate field of view.

F. The cameras shall change state when motion is detected.

G. The floor plans shall include all access controlled door and integrated devices.

H. The Contractor shall be responsible to provide all the labor to setup these maps and place all the devices.

I. The Contractor shall get sign-off from the Owner and Consultant on the finished maps.

J. The Contractor shall obtain the building plans from the Consultant for their use.

2.14 CAMERAS AND DEVICE

A. General:

1. All cameras and devices shall be time synced to the Owner’s NTP server. Coordinate with the Owner to acquire the appropriate NTP address to use.

2. Contractor shall coordinate with the owner for IP addressing, network configuration, QoS, and multicast network configuration.

3. Contractor shall enable QoS on all cameras and intercoms for the video stream, audio stream, event/alarm data, management, and metadata at the Owner's request.

4. The system shall be configured for multicast. All cameras shall have a multicast Time To Live (TTL) setting of at least 64.

5. Contractor shall select the appropriate mounting hardware for the situation.

6. All cameras shall be equipped with remote autofocus or auto back focus, with the exception of fixed lens 180/360-degree cameras and encoded analog cameras.

7. Multi-sensor 180 and 360 cameras shall have each sensor optimally calibrated independently to the conditions.

8. All cameras shall be vandal-proof and appropriate for the environment it is being installed in.

9. All cameras and devices shall have the latest VMS-recommended firmware installed, and all cameras of the same model shall have matching firmware versions. Contractor shall provide all necessary firmware upgrades to keep the Owner on the latest version throughout the duration of the project. At the completion of the project, the Owner shall have the option to receive a final firmware update to the latest version before the project is paid in full.

10. Contractor shall coordinate with the owner for IP addressing, network configuration, and multicast network configuration.

11. All cameras, regardless of manufacturer/model, shall have a consistent user name and non-standard password set. This shall be documented and provided to the owner and consultant prior to inspections.

12. Cameras and devices shall not be manufactured by or contain components manufactured by a federal, state, or local government-proposed blacklisted or sanctioned manufacturer or a subsidiary of those manufacturers.

13. Camera Installation Height: Interior cameras – 8ft – 12ft Above Finished Floor, depending on location. Exterior cameras – 9ft – 12ft Above Grade. Coordinate camera installation height with Owner Technology Department.

14. Cameras and devices shall not be an OEM or “white label” product. The camera or device shall be manufactured by the named manufacturer.

15. The cameras and devices firmware shall be developed and manufactured by the stated manufacturer and shall not be developed, written, or OEM by a 3rd party.

16. The camera requirements below represent general performance criteria. Approved equals will have slight differences in specifications. The Owner and Consultant have complete discretion to reject approved equals that stray too far from the minimum requirements.

B. Camera Type 1 (X-Core Indoor Dome)

1. Powered by WN7, Indoor Network AI IR Dome Camera, 4MP resolution @ 30FPS, 4.4~9.3mm(2.1x) (112.1°~47.5°) motorized varifocal lens, Triple codec (H.265/H.264/MJPEG), IR viewable length 40m (131.2ft), USB port for easy installation, Day & Night (ICR), extreme WDR (120dB), DIS with a built-in Gyro sensor, Handover, Hard-coated dome bubble, Analytics events based on AI engine: Object detection(Person/Face/Vehicle/License plate), IVA (Virtual line/Area, Enter/Exit, Loitering, direction, intrusion), Analytics events: Defocus detection, Motion detection, Tampering, Fog detection, Audio detection, Sound classification, Shock detection, Appear/Disappear, IP52, IK08, Operating temperature: -10 °C ~ 50 °C(14°F ~ +122°F), Power: PoE/12VDC, Metal shielded RJ-45

2. Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264, and MJPEG.

3. Interior dome camera with IP52 and IK08 ratings.

4. Native resolution of 1920x1080 pixels.

5. Integrated video analytics with object detection and classification for person and vehicle, including car, bus, truck, motorcycle, bicycle, and license plate (not LPR).

6. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.

7. Integrated business intelligence analytics with people counting, queue management, and heat mapping.
8. The minimum horizontal view angle of 119.5°-27.9°.
9. Supports hallway/corridor view mode (90°/270°).
10. Mechanical day/night IR cut filter with integrated IR up to 130'.
11. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
12. Be equipped with true multi-frame wide dynamic range (WDR).
13. The camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
14. Input power: PoE up to 12.95W and 12 VDC.
15. Manufacturer:
    a. Hanwha XND-C7083RV or replacement product

C. Camera Type 2 (X-Plus PTRZ Outdoor Dome)

1. Powered by WN7, X-Plus series, Outdoor Network AI IR Vandal Dome Camera, 4K resolution @ 30FPS, 4.4~9.3mm(2.1x) (112.1°~47.5°) motorized varifocal lens, Remote lens adjustment (PTRZ), Triple codec (H.265/H.264/MJPEG), IR viewable length 20m (66ft), USB port for easy installation, USB port for easy installation, Day & Night (ICR), extremeWDR (120dB), DIS with a built-in Gyro sensor, Handover, Hard-coated dome bubble, Analytics events based on AI engine: Object detection(Person/Face/Vehicle/License plate), IVA (Virtual line/Area, Enter/Exit, Loitering, direction, intrusion), Analytics events: Defocus detection, Motion detection, Tampering, Fog detection, Audio detection, Sound classification (with NW I/O box), Shock detection, Appear/Disappear, FIPS 140-2, 2x micro SD card (512GB x2), P66, IP67, IP6K9K, NEMA4X, IK10+, Operating temperature: -50°C~+55°C(-58°F ~ +131°F), Power: PoE+/12VDC, Metal shielded RJ-45.
2. Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264, and MJPEG.
3. Exterior dome camera with IP66/IP67, NEMA4X, and IK10 ratings.
4. Native resolution of 1920x1080 pixels.
5. Integrated video analytics with object detection and classification for person and vehicle, including car, bus, truck, motorcycle, bicycle, and license plate (not LPR).
6. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
7. Integrated business intelligence analytics with people counting, queue management, and heat mapping.
8. Minimum horizontal view angle of 119.5°-27.9°.
9. Supports hallway/corridor view mode (90°/270°).
10. Mechanical day/night IR cut filter with integrated IR up to 130'.
11. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
12. Be equipped with true multi-frame wide dynamic range (WDR).

13. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
14. Input power: PoE up to 12.95W and 12 VDC.
15. Manufacturer:
    a. Hanwha XNV-9083RZ or replacement product

D. Camera Type 3 (DUO)

1. Network vandal outdoor 2CH AI IR dome camera, (6MP X 2 sensors) 12MP @ 15fps, 3.4~6.8mm(2x) (95.08°~47.64°) motorized varifocal lens, Triple codec (H.265/H.264/MJPEG), IR viewable length 25m (82ft), USB port for easy installation, Day & Night (ICR), extremeWDR (120dB), DIS, Handover, Analytics events based on AI engine: Object detection(Person/Face/Vehicle/License plate), IVA (Virtual line/Area, Enter/Exit, Loitering, direction, intrusion), Analytics events: Defocus detection, Motion detection, Tampering, Audio detection, Sound classification, Appear/Disappear, FIPS 140-2, micro SD card 512GB, IP66, NEMA4X, IK10, Operating temperature: -40°C~+55°C(-40°F ~ +131°F), Power: PoE+, Metal shielded RJ-45, Hard-coated dome bubble
2. Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264, and MJPEG.
3. Interior/outdoor DUO camera
4. Native resolution of 3840x2160 pixels.
5. Integrated video analytics with object detection and classification for person and vehicle, including car, bus, truck, motorcycle, bicycle, and license plate (not LPR).
6. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
7. Integrated business intelligence analytics with people counting, queue management, and heatmapping.
8. Minimum horizontal view angle of 112.1°-47.5°.
9. Supports hallway/corridor view mode (90°/270°).
10. Mechanical day/night IR cut filter with integrated IR up to 130’.
11. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
12. Be equipped with true multi-frame wide dynamic range (WDR).
13. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
14. Input power: PoE up to 12.95W and 12 VDC.
15. Manufacturer:
    a. Hanwha PNM-C12083RVD

E. Camera Type 4 (QUAD)

1. Wisenet P series network vandal outdoor Multi-sensor Multi-Directional dome camera, 5MP x 4ch multi-directional camera, Motorized PTRZ support, Max. 30fps@5MP(H.265, H.264), 4.13~9.4mm(2.3x) motorized varifocal lens, IR viewable length: 30m, H.265, H.264, MJPEG codec, Multi-streaming, Video analytics, WiseStream Ⅱ, IP66, IK10, NEMA4X

2. Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264, and MJPEG.
3. Exterior/interior quad camera with IP66/IP67, NEMA4X, and IK10 ratings.
4. Native resolution of 3840x2160 pixels.
5. Integrated video analytics with object detection and classification for person and vehicle, including car, bus, truck, motorcycle, bicycle, and license plate (not LPR).
6. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
7. Integrated business intelligence analytics with people counting, queue management, and heatmapping.
8. Minimum horizontal view angle of 112.1°-47.5°.
9. Supports hallway/corridor view mode (90°/270°).
10. Mechanical day/night IR cut filter with integrated IR up to 130'.
11. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
12. Be equipped with true multi-frame wide dynamic range (WDR).
13. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
14. Input power: PoE up to 12.95W and 12 VDC.
15. Manufacturer:
    a. Hanwha PNM-9085RQZ1

F. Camera Type 5 (PANORAMIC 180 degree)

1. Network vandal outdoor Multi-sensor dome camera, panoramic view with stitched image, (5MP X 4 sensors) 15MP @ 20fps, triple codec H.265/H.264/MJPEG with WiseStream II technology, WDR 120dB, IR viewable length 20m (65.5'), built-in video analytics and sound classification, Heatmap, Bi-directional audio support, Micro SD 2 slots, IP66/IK10/NEMA4X, TPM 2.0 (FIPS 140-2 level 2), PoE+/12VDC
2. Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264, and MJPEG.
3. Interior/Exterior 180 camera with IP52 and IK10 ratings.
4. Native resolution of 1920x1080 pixels.
5. Integrated video analytics with object detection, classification, and attributes for a person (gender, upper and lower clothing color, bag, age, mast and glasses, and vehicle including car, bus, truck, motorcycle, bicycle, vehicle color, and license plate (not LPR).
6. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
7. Integrated business intelligence analytics with people counting, queue management, and heatmapping.
8. Minimum horizontal view angle of 103.1°-44.5°.
9. Supports hallway/corridor view mode (90°/270°).
10. Mechanical day/night IR cut filter with integrated IR up to 130'.

11. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
12. Be equipped with true multi-frame wide dynamic range (WDR).
13. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
14. Input power: PoE+ up to 19.50W and 12 VDC.
15. Manufacturer:
    a. Hanwha PNM-9031RV

G. Camera Type 6 (Fisheye)

1. Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264, and MJPEG.
2. Interior Fisheye camera with IP52 and IK10 ratings.
3. Native resolution of 3840x2160 pixels.
4. Integrated video analytics with object detection, classification, and attributes for a person (gender, upper and lower clothing color, bag, age, mast and glasses, and vehicle including car, bus, truck, motorcycle, bicycle, vehicle color, and license plate (not LPR).
5. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
6. Integrated business intelligence analytics with people counting, queue management, and heatmapping.
7. Minimum horizontal view angle of 101.4°-45.5°.
8. Supports hallway/corridor view mode (90°/270°).
9. Mechanical day/night IR cut filter with integrated IR up to 100’.
10. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
11. Be equipped with true multi-frame wide dynamic range (WDR).
12. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
13. Input power: PoE+ up to 20.00W and 12 VDC.
14. Manufacturer:
    a. Hanwha XNF-9013RV

H. Camera Type 7 (Indoor Dome AI Meta Data)

1. 4K Network AI IR Dome Camera, Max. 4K resolution, 0.05Lux@F1.6 (Color), 0Lux (B/W, IR LED on), Day & Night(ICR), WDR(120dB), H.265, H.264, MJPEG codec, WiseStream Ⅱ, Video Analytics based on AI, Object detection and classification(Person, Face, Vehicle, License Plate), Attribute, BestShot, Compatible with Wisenet Retail Insight v2.0 for Business Intelligence, Age/gender-based People counting, Heatmap, Queue management, Modular structure for easy installation, PoE+, Face Mask Detection, Social Distancing Detection
2. Interior dome camera with IP52 and IK10 ratings.
3. Native resolution of 1920x1080 pixels.

4. Integrated video analytics with object detection and classification for person and vehicle, including car, bus, truck, motorcycle, bicycle, and license plate (not LPR).
5. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
6. Integrated business intelligence analytics with people counting, queue management, and heatmapping.
7. Minimum horizontal view angle of 119.5°-27.9°.
8. Supports hallway/corridor view mode (90°/270°).
9. Mechanical day/night IR cut filter with integrated IR up to 130'.
10. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
11. Be equipped with true multi-frame wide dynamic range (WDR).
12. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.
13. Input power: PoE up to 12.95W and 12 VDC.
14. Manufacturer:
    a. Hanwha PND-A9081RV or replacement product

I. Camera Type 8 (Outdoor Dome AI Meta Data)

1. 4K Network AI IR Vandal Dome Camera, Max. 4K resolution, 0.05Lux@F1.6 (Color), 0Lux (B/W, IR LED on), Day & Night(ICR), WDR(120dB) H.265, H.264, MJPEG codec, WiseStream Ⅱ, Video Analytics based on AI, Object detection and classification(Person, Face, Vehicle, License Plate), Attribute, BestShot, Compatible with Wisenet Retail Insight v2.0 for Business Intelligence, Age/gender-based People counting, Heatmap, Queue management, Modular structure for easy installation, PoE+, Face Mask Detection, Social Distancing Detection Be designed to provide at least two video streams in all resolutions at a selectable range up to 30 frames per second (60Hz mode) using H.265, H.264 and MJPEG.
2. Exterior dome camera with IP66/IP67, NEMA4X, and IK10 ratings.
3. Native resolution of 1920x1080 pixels.
4. Integrated video analytics with object detection and classification for person and vehicle, including car, bus, truck, motorcycle, bicycle, and license plate (not LPR).
5. Integrated audio analytics with scream, gunshot, explosion, and glass break classification.
6. Integrated business intelligence analytics with people counting, queue management, and heatmapping.
7. Minimum horizontal view angle of 119.5°-27.9°.
8. Supports hallway/corridor view mode (90°/270°).
9. Mechanical day/night IR cut filter with integrated IR up to 130'.
10. Integrated varifocal lens, automated iris functionality, and remote focus functionality.
11. Be equipped with true multi-frame wide dynamic range (WDR).
12. Camera shall be capable of smart codecs on the H.265 and H.264 streams, including dynamic GoV and Dynamic FPS.

13. Input power: PoE up to 12.95W and 12 VDC.

14. Manufacturer:

    a. Hanwha PNV-A9081R or replacement product

2.15 CAMERA MANAGEMENT TOOLS

A. The Contractor shall setup on an appropriate server the manufacturer's camera management tools utilized to manage the settings, firmware, and status of all installed cameras. The Contractor shall train the Owner on the use of this software.

2.16 CAMERA ANALYTICS PLUG – IN

A. The Contractor shall install and configure any analytic plug-ins required on the servers and client workstations as required.

B. The Contractor shall furnish and install all licensing required to utilize the analytics and plug-ins.

2.17 EXTERNAL MICROPHONES (SPED CLASSROOM ONLY)

A. Surface Mounted Puck

B. ABS housing.

C. Line level audio, no base station power required.

D. Frequency 40 (Hz) to 15 (kHz) +/- 1 (dB).

E. Integrated 20' cable with 3.5mm connector.

F. Manufacturer:

1. Louroe Electronics Verifact A-ML (LE-770) Microphone

2. Or approved equal

2.18 ETHERNET WITH POWER OVER ETHERNET (POE) UTP SURGE SUPPRESSOR

A. The Contractor shall provide and install a surge protector for all exterior mounted cameras. Cameras that are not attached to the building or reach above the building roof line shall have a surge protector at the camera side and interior termination side.

B. There shall be a minimum of a 36" shielded patch cable from the surge protector to the device to allow for adequate clamping time.

C. When protector is mounted in interior, dry, or weather sealed enclosure:

1. Shielded RJ-45 jacks and ground stud

2. Connect ground directly to ground bar (TMGB/TGB) or building ground as close to the point of entry as practical.

3. Do not use shielded cable on the output.

D. Maximum supported data rate: 10,000Mb/s (10 Gigabit)

E. Supports IEEE 802.3af (PoE)

F. Max current rating of 30A per pair.

G. UL 497B listed

H. 110 punch down in and 110 punch down out.

1. 110 punch down in, and RJ-45 out may be used when output is connected directly to a switch or device port only when approved in specific situations.

I. Manufacturer:

1. 110 to 110 - Ditek DTK-110C6APOE
2. 110 to RJ-45 – Ditek DTK-110RJC6APOE
3. Or approved equal

J. When protector is exposed to weather or moisture:

1. Shielded RJ-45 jacks and ground connection.
2. Connected ground connection directly to ground.
3. Do not use shielded cable on the output.

K. Outdoor-rated NEMA 4X enclosure

L. Maximum supported data rate: 1,000Mb/s (1 Gigabit)

M. Supports IEEE 802.3af, 802.3at (PoE), and PoE+ up to 144 watts per port.

N. Max current rating of 20,000A per pair.

O. UL 497B listed

P. RG-45 in and RJ-45 out.

Q. Provide with appropriate mounting kit.

R. Manufacturer:

1. Ditek DTK-MRJPOEX
2. Or approved equal

2.19 PTZ CAMERA ETHERNET AND LOW VOLTAGE POWER SURGE PROTECTOR

A. The Contractor shall provide and install a surge protector for all exterior mounted cameras. Cameras that are not attached to the building or reach above the building roof line shall have a surge protector at the camera side and interior termination side.

B. There shall be a minimum of a 36” shielded patch cable from the surge protector to the device to allow for adequate clamping time.

C. When protector is mounted in interior, dry, or weather sealed enclosure:

1. Shielded RJ-45 jacks and ground
2. Connect ground directly to ground bar (TMGB/TGB) or ground.
3. Do not use shielded cable on the output.

D. Connections for 12/24V AC/DC power.

E. Maximum supported data rate: 1,000Mb/s (1 Gigabit)

F. Supports IEEE 802.3af, 802.3at (PoE), and PoE+ up to 144 watts per port.

G. Max current rating of 20,000A per pair on data connections.

H. Max current rating of 2,000A per pair on power connections.

I. UL 497B listed

J. RG-45 in and RJ-45 out.

K. Manufacturer:

1. Ditek DTK-PVPIPS
2. Or approved equal

L. The contractor shall provide remote power supplies with PoE switch and SFP modules for exterior locations that require fiber optic cable due to distances that exceed copper cable distance limitation or as identified on the drawings.

PART 3 - EXECUTION

3.01 INTEGRATION WITH PHYSICAL SECURITY SYSTEMS AND INTERCOM/PA SYSTEM

A. The video surveillance system shall be integrated with the Physical Security Systems and Intercom/PA system via an Ethernet interface with the minimum follow features.

1. Graphical floor plan maps showing icons of all cameras, intercoms and other integrated systems.
2. Camera views associated with intercom stations and doors.
3. Camera views linked to other camera views for seamless tracking of a subject throughout a facility.
4. Device names brought in from the integrated systems.
5. Database entries for all actions performed.
6. Time syncing via common NTP server.
7. Microsoft Active Directory integration.
8. Microsoft Exchange integration for email notifications.
9. Intercom audio recorded to VMS server synchronized with the associated camera.

B. The Contractor shall provide any and all licensing to integrate the systems together including any additional items to be added to the yearly maintenance agreement.

C. Refer to the individual specification sections for additional specific integration requirements.

D. The Contractor shall set up a meeting between the Owner, Consultant and manufacturer to determine the exact functionality of the integration before the integration starts.

3.02 SYSTEM PROGRAMMING

A. The Contractor shall provide all programming necessary for a turnkey system.

B. Programming shall include setting all required IP addressing, setting passwords, firmware upgrades, adding the devices into the software, setting video streams, motion detection areas, recording settings, device naming, mapping, cross system integration, etc.

3.03 SYSTEM PARTITIONING, ZONING, AND NAMING

A. The Contractor shall program each facility to be in its own partition. Some facilities may require sub-partitions to control user access to certain areas. Each manufacturer may use different names for partitions, zones, areas, etc. Adapt as required.

B. All devices, inputs, outputs, and other applicable software/hardware entities shall be named by the Contractor.

C. As a basis to start, the following partition, zoning, and naming shall be followed:

1. Partition: Building name

a. Zone 1: Building name and zone name such as exterior, 1st floor, etc.

i. Device 1: Building name and floor number– Camera or other device name

ii. Device 2: Building name and floor - Camera or other device name

iii. Repeat as required

b. Zone 2: Building name and zone name such as 2nd floor, etc.

i. Device 1: Building name and floor - Camera or other device name

ii. Device 2: B Repeat as required

iii. Repeat zones as required.

c. Repeat Partitions as required.

D. Camera Naming

1. All cameras shall be named based on Owner direction.

2. Multi-sensor cameras shall be named similar, and each sensor shall end with an identifier such as A, B, C, and D so the images can be easily aligned in the client software by an end user.

3.04 VMS VIDEO STREAMING

A. All cameras shall have the following VBR streams configured. If a camera or VMS is not capable of the quantity of streams listed below when they shall be set for dual streaming at the Record settings and Live viewing settings.

B. The VMS and cameras shall be setup and enabled for multicast.

1. Stream 1 (Record and High Resolution)

a. Interior Cameras:

i. 10 fps

ii. 1 keyframe (I-Frame) per 4 seconds

iii. Max resolution

iv. 100% recording with motion enabled for metadata.

v. VBR with no cap or high cap when smart codecs are enabled.

vi. H.264 Main Profile compression

vii. Smart codec enabled at the following settings:

viii. Medium (50%) dynamic compression setting

ix. Dynamic GoP of up to 30 seconds

x. Dynamic frame rate enabled

xi. AAC Audio encoding (for cameras with microphones connected or built into them).

b. Exterior Cameras:

i. 10 fps

ii. 1 keyframe (I-Frame) per 4 seconds

iii. Max resolution

iv. 100% recording with motion enabled for metadata.

v. VBR with no cap or high cap when smart codecs are enabled.

vi. H.264 Main Profile compression

vii. Smart codec enabled at the following settings:

viii. Medium (50%) dynamic compression setting

ix. Dynamic GoP of up to 30 seconds

x. Dynamic frame rate disabled

2. Stream 2 (Live)

a. 10 frames per second

b. ~850x450 resolution for 16:9 aspect ratio cameras and 640x480 for 4:3 aspect ratio cameras. Always maintain the native aspect ratio of the camera.

c. H.264 Main Profile compression

d. Smart codec enabled at a medium setting with a dynamic GoP of up to 8 seconds.

e. 1 key frame per 4 seconds

f. Automatic stream selection with dynamic resolution (resolution of camera window on VMS client)

3. Stream 3 (Low Resolution)

a. 10 frames per second

b. ~1280x720 resolution for 16:9 aspect ratio cameras and 1024x768 for 4:3 aspect ratio cameras. Always maintain the native aspect ratio of the camera.

c. H.264 Main Profile compression

d. Smart codec enabled at a medium setting with a dynamic GoP of up to 8 seconds.

e. 1 key frame per 4 seconds

f. Automatic stream selection with dynamic resolution (resolution of camera window on VMS client)

4. Stream 4 (Web/Remote/Mobile Client)

a. 5 frames per second

b. MJPEG at 50% quality when VMS requires for web or mobile clients to avoid transcoding from H.264.

c. ~850x450 resolution for 16:9 aspect ratio cameras and 640x480 for 4:3 aspect ratio cameras. Always maintain the native aspect ratio of the camera.

d. Data rate cap or as appropriate based on available bandwidth and use case.

e. Automatic stream selection with dynamic resolution (resolution of camera window on VMS client)

3.05 CAMERA POSITIONING PROCEDURES

A. The Contractor shall provide an initial aim, zoom, field of view adjustment, rotation and focus immediately after the camera is installed following the design intent on the drawings and camera schedule.

B. The Contractor shall then take screen shots from the camera's web interface, label them based on the drawings device number and present them to the Owner and Consultant for an initial review and comment. The Contractor shall furnish a battery powered PoE injector to power up the camera to provide the initial aim/focus and screen shots and shall not rely on the Owner's network or PoE switches to be online or available.

C. The Contractor shall then fine tune the cameras aim and field of view based on the Consultant's feedback and update the screen shots.

D. After the cameras aim, zoom, field of view adjustment and focus are finalized by the Consultant, the Contractor shall submit the screen shots to the Owner to obtain their final sign-off or comments. If any comments are received, the Contractor shall make the adjustments necessary and take updated screen shots and submit for re-approval.

E. The above will not happen at the same time and the Contractor shall plan on multiple trips to the project to make the adjustments.

F. The Contractor shall include the final screen shots as part of the as-builts.

3.06 PASSWORDS

A. The Contractor shall coordinate a secure project password with the Owner and Consultant. This password shall be documented by the Contractor and used for all devices.

B. This secure password shall be set in the archiver default password field and each device in the video unit tab shall be set to use that set default.

3.07 Archive Transfer (Video Trickling) Requirements

A. All wireless connected cameras camera shall be set to record to local SD storage upon loss of wireless connectivity.

B. The Contractor shall setup and configure archive transfer (video trickling) on both the camera and server. Upon loss and restoration of connectivity the camera shall trickle the video back to the archiver so there is no loss in recorded video.

C. Each camera shall have its own individual archive transfer configured with a 30 second delay on transfer after reconnection.

D. Follow manufacturers best practices guide for configuration.

3.08 TESTING

A. Refer to Section 27 00 00 for additional requirements.

B. Prior to energizing or testing the system, ensure the following:

1. All products are installed in a proper and safe manner per the manufacturer's instructions.

2. Dust, debris, solder, splatter, etc., is removed.

3. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

4. All products are neat, clean, and unmarred, and parts are securely attached.

C. Contractor shall ensure that each device in the security system is functioning normally and in such a manner as to meet the functional and performance requirements in this specification.

3.09 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

B. Provide system operations, administration, and maintenance training by factory-trained personnel qualified to instruct.

1. Contractor shall provide up to 80 hours of scheduled and dedicated training time in twenty (20)) four (4) hour sessions for administration and investigation.

2. Contractor shall provide up to 2 hours of scheduled and dedicated training time for maintenance including lens and dome cleaning, focusing and positioning.

3. Provide printed training materials for each trainee, including product manuals, course outline, workbook or student guides, and written examinations for certification.

4. Provide hands-on training with operational equipment.

5. Training shall be oriented to the specific system being installed under this contract as designed and specified.

6. Contractor shall provide all necessary documentation of system operating parameters prior to scheduled training sessions.

3.10 WARRANTY

A. The cameras shall be warranted by the manufacturer for five (5) years.

B. Refer to Section 27 00 00 for additional requirements.

3.11 INSTALLATION PRACTICES

A. All services provided shall be professional and conform to the highest standards for industry practices. The Owner reserves the right to halt any installation due to poor workmanship. All work shall be defect free, and the installer shall replace, at their expense, any work found to be defective.

B. The Owner reserves the right to halt any installation due to failure of Contractor to observe installation-free periods due to instructional or administrative requirements. To the maximum extent possible, the Owner will provide advance notice of such periods.

C. Contractor is responsible for providing a complete and functional video surveillance system.

D. All manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by the manufacturers, or as indicated in their published literature, unless specifically noted herein to the contrary.

E. Contractor shall follow these standards and approved submittals for locations of power supplies. The Owner intends to limit the number and location of power supplies to facilitate more effective long-term support and maintenance of the system.

3.12 COORDINATION

A. Contractor shall provide up to 8 hours (up to four, 2-hour sessions) of scheduled and dedicated coordination time to assist Owner with camera positioning/repositioning and coordination as requested by Owner or Consultant including post final signoff.

3.13 AESTHETICS

A. All cables and equipment terminating at panels frames shall be vertically straight, with no cables crossing each other, from twelve inches inside the ceiling area to the termination block.

B. All cable bundles shall be combed and bundled to accommodate individual termination block rows and panels.

C. For any given telecom room, a horizontal and vertical alignment for all mounting hardware will be maintained to provide a symmetrical and uniform appearance to the distribution frame.

D. All surface-mounted devices shall be firmly secured level and plumb

E. All rack mount equipment shall be securely installed.

3.14 HARDWARE LAYOUT

A. Hardware positioning and layout shall be reviewed and approved by the Owner prior to construction. The review does not exempt Contractor from meeting any of the requirements stated in this document.

3.15 VMS INSTALLATION PRACTICES

A. Verify that the manufacturer approved server hardware, OS meets the Owner’s IT standards prior to ordering.

B. Coordinate server power, cooling, and mounting requirements with Owner prior to installation.

C. Coordinate virus scan/security software requirements with Owner and manufacturer prior to installation.

3.16 DEVICE CABLING/WIRING INSTALLATION PRACTICES

A. All external wire and cables shall be supported at least every five feet from the structure or as required to maintain not more than 12" cable sag between supports and without over tensioning the cables. Provide j-hooks as needed where cable tray or raceway is not available.

B. This Contractor shall coordinate installation with Division 27 05 00 cabling Contractor to ensure there is at least 2-inches of physical separation between security cabling and voice/data cabling throughout cable path. Voice/data cabling Contractor has first claim to cable tray.

C. All cables, regardless of length, shall be labeled within 18" of both ends with an identifier that is keyed to the door, room, or corridor number as identified.

D. All cables shall have 6-foot service loops neatly coiled in the equipment room. During initial cable rough-in, this Contractor shall have sufficient slack to route anywhere within the equipment room.

E. Cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame. Cables shall be dressed in a neat and orderly fashion. Any cabling or equipment installation that is deemed unacceptable by the Owner or Consultant shall be replaced or corrected by the Contractor at no additional cost. Plastic zip ties are not allowed.

F. All cables are to run at right angles to the structure, placed above the ceiling in halls or corridors.

G. Cables shall not run above red iron joist.

H. Contractor shall make every effort to conceal wiring and other apparatus into walls, floors, and ceilings, assuming code and good engineering practice allows and suggests.

I. Ties and straps shall be installed snugly without deforming cable insulation. Ties shall be spaced at uneven intervals not to exceed four feet. No sharp burrs shall remain where excess length of the cable tie has been cut.

J. Contractor shall notify Owner immediately if obstruction or hazard is discovered in a pathway provided by others.

K. Cable shall be stored and handled to assure that it is not stretched, kinked, crushed, or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or recommendations. Cable shall not be installed in ambient temperatures or moisture conditions above or below the manufacturer’s rating.

L. No splices shall be installed in any cable.

3.17 CABLE TERMINATION

A. Termination hardware (blocks and patch panels) positioning and layout shall be reviewed and approved by the Owner prior to construction. The review does not exempt Contractor from meeting any of the requirements stated in this document.

3.18 FIRE STOPPING

A. Fire stopping of openings between floors, fire-rated walls, and smoke-rated walls, created by others for This Contractor to pass cable through, shall be the responsibility of the This Contractor. Sealing material and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work.

B. Any openings created by or for This Contractor and left unused shall be sealed up by This Contractor.

C. This Contractor shall be responsible for creating a waterproof seal in and around any openings that This Contractor creates from the structure to the outside environment.

3.19 SYSTEM INSPECTION

A. Contractor shall coordinate with project representative for inspection after Contractor has completed testing of entire system.

B. Contractor shall have trained Contractor representative and testing equipment on site during inspection to assist with spot verification of tests.

C. Contactor shall verify with Project Representative the precise positioning of camera aim and shall make fine adjustments as requested.

3.20 LABELING

A. Contractor shall neatly label all security devices and cabling at both ends. All labels shall be on Project as-built drawings.

3.21 CAMERA INSTALLATION

A. Contractor shall field verify all camera locations and positioning with Owner prior to installation.

3.22 DOCUMENTATION

A. Upon completion of the installation, Contractor shall provide full documentation sets to the Consultant for approval as described in section 27 60 00. All documentation shall become the property of the Owner.

B. Documentation shall include the additional specific items detailed in the subsections below:

1. Contractor shall provide hard copy and electronic forms of the final test results.
2. Contractor shall provide a document including the following:
    a. Camera label/identifier
    b. Location of each drop by orientation/permanent landmark in the room
    c. Contractor shall provide accurate as-built Construction Drawings. The drawings are to include cable routes and device locations.

3.23 PRE-CHECKOUT

A. The Contractor shall demonstrate the following to Owner during system demonstration.

1. The cameras are fully installed and functional.
2. Camera adjustments are complete to the Owner’s satisfaction including.
    a. Aim/Zoom
    b. Focus/Back Focus
    c. Masking Zones
    d. Motion Detection Zones
    e. Pre-Sets/Tours

3.24 FINAL ACCEPTANCE

A. In addition to closeout requirements in section 27 60 00, This Contractor shall demonstrate the following before final approval.

1. Owner training is complete.
2. Punch list items are complete.
3. As-built documentation is complete and submitted to Owner/Consultant.

3.25 FINAL PROCEDURES

A. Perform final procedures in accordance with section 27 60 00.

End of Section

SECTION 27 66 00

INTRUSION DETECTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. This specification section covers the furnishing and installation of a new and complete, low-voltage Intrusion Detection System (IDS).

B. Contractor shall furnish and install intrusion detection hardware devices, mounting brackets, power supplies, switches, controls, consoles, and other components of the system as shown and specified.

C. Provide necessary materials, hardware, software, and cabling required to furnish a fully functional system as shown and specified.

D. Provide all required programming, testing, and commissioning for a complete turn-key system.

E. All new category cables shall be minimum Cat6A. Reference project specifications for cable part number.

F. Intrusion motion sensors at stairwells and perimeter doors shall be ceiling mounted directional type. Panoramic motion sensors shall be used exclusively in offices and instructional areas.

G. Furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation. Requirements shall be in accordance with Division 26 00 00, Electrical.

H. Integration with Genetec Security Center.

I. Refer to Section 27 00 00 for additional project scope information.

1.02 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 05 00 – Communications General Requirements

C. Section 27 05 26 – Grounding and Bonding for Technology Systems

D. Section 27 05 28 – Pathways for Technology Systems

E. Section 27 05 37 – Firestopping for Technology Systems

F. Section 27 11 00 – Communications Equipment Rooms

G. Section 27 15 00 – Communications Horizontal Cabling

H. Section 27 16 00 – Communications Connecting Cords

I. Section 27 18 00 – Communications Labeling and Identification

J. Section 27 51 00 – Distributed Communications Systems

K. Section 27 60 00 – Physical Security General Requirements

L. Section 27 64 00 – Video Surveillance System

M. Section 28 13 16 – Electronic Access Control System

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for additional definitions.

1.04 REFERENCE STANDARDS AND CODES

A. National Electric Code, Article 760.

B. National Fire Alarm Code (NFPA 72).

C. Administrative Council for Terminal Attachments (ACTA):

1. ANSI/TIA-968-A-2002 Technical Requirements for Connection of Terminal Equipment to the Telephone Network.

D. 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.

E. 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).

F. 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).

G. 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 985 - Household Fire Warning System Units.

6. UL 1023 - Household Burglar Alarm System Units.

7. UL 1076 – Proprietary Burglar Alarm Units and Systems

8. UL 1610 - Central Station Burglar-Alarm Units.

9. UL 60950-1 - Information Technology Equipment - Safety.

10. UL 636 – Hold up alarms

H. Refer to Section 27 00 00 for additional requirements.

1.05 QUALIFICATIONS

A. The Contractor shall be a Bosch Expert or Master certified dealer.

B. Refer to Section 27 00 00 for additional requirements.

1.06 PRE-CONSTRUCTION SUBMITTALS

A. The Contractor shall submit the intrusion detection hardware layouts which includes the number of controllers, sub-panels and other associated devices per location.

B. The Contractor shall submit full power calculations which includes the anticipated power loads, number and type of power supplies including all power supply boards, number of 120VAC circuits required, battery backup including the quantities of batteries to meet requirements.

C. Refer to Section 27 00 00 for additional requirements.

1.07 PRE-INSTALLATION PROCEDURES

A. For in-use, existing facilities or retrofit projects, the Contractor shall assign all applicable electronics IP addresses, passwords and pre-build out all the enclosures including the interconnects within the enclosure prior to being delivered to the project or installed.

B. The Contractor shall cable all monitored doors, detectors, etc. and terminate this cable in the control panels no less than 3 weeks prior to substantial completion regardless of the status of the field devices.

C. The Contractor shall program the intrusion detection system no less than 2 weeks prior to substantial completion so when field devices are installed and terminated, the full system functionality can be tested. Programming shall include all monitored doors, associated inputs, outputs, and interoperability regardless of final field device status.

D. The Contractor shall perform final connections and testing onsite when field devices has been installed.

E. Refer to section 27 00 00 for additional requirements.

1.08 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.09 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 ALARM CONTROL PANEL

A. Shall be fully programmable multi-zone zone UL listed, Commercial intrusion alarm panel. Minimum features include:

1. 599 programmable points with up to 63 point profiles
2. 32 areas
3. 32 keypads
4. 504 RF points supporting Radion, Innovonics and Z-Wave.
5. Supports virtual inputs
6. 2,000 users
7. Ground fault monitoring
8. Programmable for Fire, Intrusion, Access, Gas, and Supervisory devices.
9. Cloud enabled with mobile app and remote programming capabilities.

B. The panel shall include onboard 10/100 full duplex Ethernet connectivity.

1. Provide with secondary 10/100 full duplex ethernet expansion module where required for integration to 3rd party systems or as otherwise required.

C. Supports multiple EoL resistor options:

1. Dual 1 kΩ (1 kΩ + 1 kΩ)
2. Single 1 kΩ
3. Single 2 kΩ
4. No EoL

D. Provide with all appropriate modules as required for a complete system.

E. Requires 16.5-18 VAC, provide with appropriate power supply connection as specified within this section. Pluggable transformers “wall warts” are not allowed.

F. UL 365, 609, 636, 1610, 1635 and 1076 listed.

G. Integrated battery charger.

H. Expansion slots for onboard cellular or digital dialer primary or backup communication.

I. The panel shall be hardwired to a dedicated electrical circuit. Wall warts are not acceptable.

J. All controllers and expansion modules shall have the latest recommended firmware installed and shall have matching firmware versions. The Contractor shall provide all necessary firmware upgrades to keep the Owner on the latest version throughout the duration of the project. At the completion of the project the Owner shall have the option to receive a final firmware update the latest version before the project is paid in full.

K. Manufacturer:

1. Bosch B9512G

2.03 PROGRAMMING AND MANAGEMENT SOFTWARE

A. Provide software platform to manage remote programming, account storage, remote control, and diagnostics for compatible control panels.

B. Provides automated reporting and time synchronization.

C. Can create templates for quicker programming of new panels.

D. Provides remote firmware updating capabilities.

E. Can operate as an unattended live server service.

F. Compatible with Windows Server 2012 R2 and Windows 10.

G. Compatible with Microsoft SQL 2012 SP2, 2014 2016, 2017 and 2019. Utilize SQL 2019 when Owner does not have a central SQL server.

H. Optional user management module add on supports up to 250,000 users and 10,000 control panels to provide centralized user management and historical reporting.

I. The Owner shall be able to receive all major and minor software updates at no additional cost for the duration of the project. At the completion of the project the Owner shall have the option to receive a final software update to the latest version before the project is paid in full.

J. Manufacturer:

1. Bosch RPS (Remote Programming Software) D5500CU

a. Provide with (1) Bosch D5370-USB Security Dongle

2.04 KEYPADS, TOUCH SCREEN

A. The Contractor shall furnish and install (1) touch screen keypad next to, or on the door of the main intrusion detection panel enclosure in addition to other locations noted.

B. Color backlit touch screen.

C. UL Listed.

D. Requires 12 VDC @ 400 mA.

E. Onboard inputs and outputs shall not be utilized.

F. Disable the onboard prox reader.

G. Manufacturer:

1. Bosch B942W

2.05 INPUT EXPANSION MODULE

A. Provide input expansion modules for all devices. Controller onboard inputs are reserved for other uses. Inputs from keypads shall not be used.

B. 8 input expansion module.

C. Requires 12 VDC @ 35 mA.

D. POPIT modules are not allowed

E. Manufacturer:

1. Bosch B208

2.06 OUTPUT EXPANSION MODULE

A. 8 output expansion module.

B. Dry contacts rated up to 24 VDC @ 1A.

C. Requires 12 VDC @ 150 mA.

D. Manufacturer:

1. Bosch B308

2.07 POWER SUPPLY EXPANSION MODULE

A. The Contractor shall provide a supervised power supply module for each intrusion panel to provide power to the detectors and batteries.

B. Requires 18VAC input.

C. Provides up to 4A of power at 12VDC.

D. High capacity battery charging circuit with 150mA output power for charging up to 2 batteries.

E. Supervised.

F. Manufacturer:

1. Bosch B520

2.08 TRANSFORMER POWER SUPPLY

A. TR1850, 18 VAC,50 VA

2.09 TRANSFORMER PLUG IN:

A. Bosch D1640, 16V40A

2.10 BATTERIES AND BACKUP

A. The Contractor shall provide a minimum of (2) 12V, 7ah, sealed Absorbent Glass Mat (AGM) style batteries with F style terminals per power supply and (1) per control panel. Provide additional as required based on calculated power load.

B. Provide adequate battery backup as required by Authority Having Jurisdiction (AHJ) or a minimum of 8-hours.

C. Manufacturer:

1. Bosch D126

2. Power Sonic PS-1270

3. Or approved equal

2.11 END OF LINE SUPERVISION

A. All monitored intrusion detection devices shall include EoL monitoring.

B. Provide a dual 1k + 1k end of line (EoL) pre-built resistor pack. GRI (George Risk Industries, Inc.) 6644 series or approved equal.

1. Adjust resistance values as required by the manufacturer.

2.12 POPIT EXPANSION MODULE

A. Provides connection up to 100 POPIT input modules.

B. Install at panel location.

C. Provide quantity as required.

D. Manufacturer:

1. Bosch B299

2.13 POPIT INPUT MODULE

A. Provide for each device on bus.

B. Integrated tamper switch

C. 12 VDC operating voltage.

D. Utilize 33 K-ohm EoL resistor.

E. Manufacturer:

1. Bosch D9127T

2.14 FIBER OPTIC EXTENSION

A. Where specifically identified or required, the Contractor shall furnish and install fiber optic serial media converters to extend the intrusion data bus to remote facilities.

B. Provide single-mode or multi-mode as required.

C. Requires 9-30 VDC operating voltage. Provide 12 VDC power from the intrusion detection supervised power supply.

D. Selectable Baud Rate up to 250,000 kbps.

E. Supports multiple operation modes: Point-to-Point, and Ring (half-duplex)

F. Supports Half/Full-duplex, bidirectional transmission mode.

G. Automatic RS-485 data flow control.

H. Do not connect more than (3) SDI2 devices.

I. Refer to manufacturer’s tech notes for additional specific installation and configuration instructions.

J. Manufacturer:

1. ComNet

a. FDX60M1(A/B)-M for multi-mode applications

b. FDX60S1(A/B)-M for single-mode applications.

c. Add /C for optional conformally coated circuit boards when used in exterior or high humidity locations.

2. Or Intrusion manufacturer recommended alternate.

2.15 DOOR CONTACTS/DOOR POSITION SWITCHES (DC)

A. The Security Contractor shall be responsible for the connection of all door position devices to the intrusion detection system. Door position devices shall be integral to the door hardware whenever possible. The Contractor shall refer to the door hardware schedule and coordinate with the door hardware Contractor on locations and requirements.

B. Sealed and potted magnetic reed switch in contact housing.

C. Provide DPDT for applications with multiple security systems (Access Control/Intrusion Detection or PLC) utilizing a single door contact.

D. Door contacts shall be appropriately sized for any established holes within door frames.

E. Parts provided are basis of design. Determination of final part number is the responsibility of Contractor.

F. Provide color that matches door as close as possible.

G. Provide recessed switch whenever possible.

H. Armored whip for surface mount contacts.

I. Provide GRI (George Risk Industries, Inc.) 180 Series for recessed applications.

1. GRI DPT 195 -12WG ¾'' door contact DPDT with 9'' leads
2. Magnasphere
3. Nascom
4. Or approved equal.

J. Provide GRI (George Risk Industries, Inc.) 4400 series for surface mount applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

K. Provide GRI (George Risk Industries, Inc.) MC-180 Series for hollow top channel applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

L. Provide GRI (George Risk Industries, Inc.) 4532 Series for overhead door applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

2.16 MOTION DETECTORS

A. The motion detector shall be a multi-technology, IR and range adaptive radar device.

B. Reduces false alarms by sensing both heat, physical motion and compensation algorithms.

C. Wide angle: 60’ x 80’ standard coverage, selectable 25’ x 33’ coverage.

D. Long range: 8.5’ x 100’ standard coverage, selectable 3.3’ x 25’ coverage.

E. Active white light suppression

F. Dynamic temperature compensation

G. Draft and insect immunity

H. Sensor data fusion

I. Power requirements: 9-15 VDC

J. Maximum current draw of 26ma at 12VDC.

K. Can be mounted between 7’-10’ with no adjustments.

L. Provide with appropriate mounting hardware, Bosch B328 (wall), B338 (ceiling) or equal.

M. White.

N. Manufacturer:

1. Wide Angle: Bosch ISC-PDL1-W18G
2. Narrow Angle, long range: Bosch ISC-PDL1-WC30G
3. Motion detector protective guards. STI9600 Series.
4. Or approved equal

2.17 360 MOTION DETECTORS

A. The motion detector shall be a multi-technology, IR and range adaptive radar device with anti-mask.

B. Reduces false alarms by sensing both heat, physical motion and compensation algorithms.

C. 360 Degree coverage: 52’ diameter.

D. Active white light suppression

E. Dynamic temperature compensation

F. Draft and insect immunity

G. Sensor data fusion

H. Power requirements: 9-15 VDC

I. Maximum current draw of 24ma at 12VDC.

J. Can be mounted between 8’-20’ with no adjustments.

K. Mounts to standard 1-gang 3.5” rectangular electrical box.

L. White.

M. Manufacturer:

1. 360 degree: Bosch DS9370
2. 360 degree: Bosch DS936
3. Or approved equal

2.18 PANIC AND DURESS BUTTONS

A. Stainless steel cover

B. DPDT contacts for connecting to multiple systems

C. Fully supervised

D. Reset key for testing and resetting alarms

E. Recessed latching button to prevent accidental activation

F. Coordinate exact mounting location with Owner prior to purchase and installation

G. Manufacturer:

1. Honeywell 269R
2. Or approved equal

2.19 MECHANICAL SENSORS

A. The Contractor shall cable and connect to the facilities boiler alarms, refrigerator/freezer alarms, compressor alarms, etc. Each sensor shall be its own zone for independent arming and disarming. Coordinate with Owner on specific requirements.

2.20 INTRUSION DETECTION PANEL ENCLOSURES

A. Provide a power supply/chargers and sub-assemblies to power various intrusion controller boards, detectors, audible/visual alarms and other access control or security system components. The Contractor shall select the appropriate enclosure, power supply and sub-assemblies for each application.

B. Enclosures

1. Shall be capable of accommodating power supplies, sub-assemblies and other manufactures boards when required.
2. Wall mountable.
3. Include a cam-lock and tamper switch.
4. Provide with main backplane and door backplane.
5. Provide with power rocker switches between each transformer and the board.
6. Manufacturer:

a. Altronix Trove2BH2 with TBHD2 door backplane or as appropriate for intrusion panel manufacturer.

C. Sub-Assemblies

1. The Contractor shall provide all sub-assemblies to meet the project requirements.
2. Access Control Module
    a. Independently controlled fused protected outputs:
        i. Fail-Safe and/or Fail-Secure power outputs.
        ii. Dry form “C” 5 amp rated relay outputs (fused).
        iii. Any combination of the above
3. Access Control System trigger inputs:
    a. Normally open (NO) inputs.
    b. Open collector sink inputs.
    c. Any combination of the above.
4. Multi-Output Power Distribution Module
    a. Single input distributed over eight (8) or sixteen (16) outputs.
    b. Fused protected outputs.
    c. Output terminals shall accommodate up to 12AWG wires.
5. Multi-Output Power Distribution Module with Dual Inputs
    a. Two (2) inputs distributed over eight (8) outputs.
    b. Outputs shall be configurable by input.
    c. Fused protected outputs.
    d. Output terminals shall accommodate up to 12AWG wires.
6. Power supplies and sub-assemblies shall be manufactured by Altronix or approved equal:
    a. Altronix ACMS8 – Dual input, eight (8) output, fused Access Control Module (UL listed Sub-assembly).
    b. Altronix PDS8 - Dual input, eight (8) output, fused power distribution module (UL listed Sub-assembly).
    c. Altronix PD16W – Selectable dual input, sixteen (16) output, fused power distribution module (UL listed Sub-assembly).
    d. Altronix RSB2 – Rocker switches with mounting bracket.

2.21 POWER TRANSFORMERS

A. The Contractor shall provide all required transformers and power supplies.

B. The power supplies shall be hardwired. Pluggable “wall wart” transformers are forbidden.

C. Provide with enclosure as required.

D. 115 VAC input.

E. Provide a 16 VAC output @ 6.25A transformer to power the control panel.

F. Provide a 18 VAC output @ 16.7A transformer to power the power supply module.

G. Connect transformers outputs through rocker switches to control on/off power to the panels for service.

H. Manufacturer:

1. Altronix

a. 16VAC Transformer - T16100C

i. Mount above Altronix Trove 2 enclosure in the included Altronix CAB4 enclosure.

b. 18VAC Transformer - T1618300K

i. Mount within Altronix Trove 2 enclosure on main backplane in the upper left corner square punch.

2. Or approved equal

2.22 SURGE PROTECTION FOR DATA AND POWER BUS

A. The Contractor shall provide a surge protector for all data/power bus applications that run underground or through an area with high surge risk.

B. Mount unit outside of the power supply/control panels. Provide with appropriate mounting and enclosures as required.

C. There shall be a minimum of a 36” of cable from the surge protector to the device to allow for adequate clamping time.

D. When protector is mounted in interior, dry or weather sealed enclosure:

1. Nominal voltage rating of 12V AC/DC. Provide correct module per required voltage level if different from 12V.

2. 20,000A surge current rating.

3. Protects 2-pair per module.

4. Accepts up to 12 AWG cable

5. Connect directly to ground.

6. UL 497B listed

7. Provide quantity of modules as required for the application.

8. Provide base mounting plate as required for the application.

9. Manufacturer:

a. Ditek DTK-MB10 Mounting Base, upsize as required if multiple modules are required.

b. Ditek DTK-2MHLP12F Surge Module, (1) per 2-pair

c. Or approved equal

2.23 CABLES

A. Provide cabling per manufacturer's recommendations and code requirements for riser rated, plenum, and non-plenum cable types.

B. UTP data cabling required will be provided, installed, terminated and tested by the Division 27 structured cabling Contractor.

C. Door Contacts, Panic/Duress Buttons, mechanical sensors, etc.: 18-gauge, four-conductor, unshielded, stranded cable shall be provided for all door contacts. The cable shall be fluorescent green or lima green in color and plenum rated.

D. Motion Detectors: 18-gauge, four-conductor, unshielded, stranded cable shall be provided for all motion detectors. The cable shall be fluorescent green or lima green in color and plenum rated.

E. Keypads/SDI2 Bus: 18-guage, four-conductor, non-shielded, non-twisted, stranded cable shall be provided for keypads. The cable shall be fluorescent green or lima green in color and plenum rated. Keypad cabling shall not exceed 390 feet. Cable impedance shall not exceed 100 ohms.

F. Wireless Receivers/Repeaters Power Cable: 18-gauge, four-conductor, unshielded, stranded cable shall be provided for all wireless receivers and repeaters. The cable shall be fluorescent green or lima green in color and plenum rated. The cable shall not exceed 328 feet. Increase gauge as required based on voltage drop.

G. POPIT Bus: 18-guage, four-conductor, non-shielded, twisted (6-twist per foot min), stranded cable shall be provided for the POPIT loop. The cable shall be fluorescent green or lima green in color and plenum rated. Cable impedance shall not exceed 100 ohms. Do not exceed manufacturer recommendations for maximum cable length. Furnish and install a 33-kohm EoL resistor on the last device in the loop.

H. Follow manufacturer's recommendations for all systems cabling.

PART 3 - EXECUTION

3.01 PHYSICAL SECURITY INTEGRATION

A. The intrusion detection system shall be integrated with the electronic access control system (Genetec Security Center).

B. The access control/intrusion detection interface shall be via an Ethernet interface. Contact closure integration is not acceptable.

C. Provide one license per panel to connect to Genetec Security Center.

D. The Contractor shall provide any and all licensing to integrate the systems together including any additional items to be added to the yearly maintenance agreements.

E. Refer to the Electronic Access Control specifications for additional specific integration requirements.

F. The Intrusion system shall be time syncing to a common NTP server across all security systems.

G. The Intrusion system shall synchronize users enrolled or removed through the access control system.

H. The Intrusion system shall disarm on first in authorized and valid card read. Authorized means the user has the appropriate permissions to disarm the intrusion system.

I. The Contractor shall set up a meeting between the Owner, Consultant and manufacturer to determine the exact functionality of the integration before the integration starts.

3.02 SYSTEM PROGRAMMING

A. The Contractor shall set the Ethernet communications to TCP/IP.

B. The Contractor shall enable 128-bit AES encryption when required.

C. The Contractor shall program all inputs EoL resistance values. All inputs shall have an EoL unless specifically submitted on and approved by the Consultant.

D. The Contractor shall configure mail server SMTP settings and port. The Contractor shall coordinate with the Owner on email accounts to be added.

E. Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters).

F. Programming operational parameters such as opening/closing reports and windows, system response text displays of events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.

G. Programming passcodes according to the authorities and functions defined by the Owner.

H. The Contractor shall program all compliance and panel wide parameters including onboard and add-on module ethernet parameters, Cloud Remote Connect settings, report routing, power supervision, RPS parameters, miscellaneous settings, etc.

I. The Contractor shall set all point, point profiles, area and debounce times according to the requirements, best practices and Owner requirements. The Contractor shall create custom point profiles as required for desired functionality.

J. The Contractor shall set all Area necessary parameters including force arm/bypass, exit delay time, restart time, area type, part on, exit/entry delay warning, area re-arm time, etc.

K. The Contractor shall assist with entering users, authority levels and PINs.

L. Other system programming tasks required by the owner. These additional programming requirements shall be coordinated between the owner and the contractor.

M. Operational Testing: The contractor shall perform thorough operational testing, walk testing, and verify that all system components are fully operational.

N. Hard-copy System Printout: The contractor shall submit a hard-copy system printout of all components tested and certify 100 percent operation indicating all devices/panels/units have passed the test criteria set forth by the manufacturer.

O. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through.

P. This form shall include separate sections for each device/panel/unit as well as a column indicating the manufacturer's performance allowance/margin, a column indicating the result of the testing performed by the contractor (pass/fail), and an empty column for recording findings during the walk-through.

3.03 SYSTEM PARTITIONING, ZONING AND NAMING

A. The Contractor shall program each facility to be in its own partition. Some facilities may require sub-partitions to allow arming and disarming of specific areas. Each manufacturer may use different names for partitions, zones, areas, etc. Adapt as required.

B. All devices, inputs, outputs and other applicable software/hardware entities shall be named by the Contractor.

C. As a basis to start, the following partition, zoning and naming shall be followed:

1. Partition: Building name

a. Zone 1: Building name and zone name such as 1st floor, gym, auditorium, etc.

i. Device 1: Building name and floor number – detector or device name

ii. Device 2: Building name and floor - detector or device name

iii. Repeat as required

b. Zone 2: Building name and zone name such as 2nd floor, etc.

i. Device 1: Building name and floor - detector or device name

ii. Device 2: Building name and floor - detector or device name

iii. Repeat as required

c. Repeat zones as required.

2. Repeat Partitions as required.

D. DEVICE NAMING

1. All devices shall be named based on Owner direction.

E. The Owner shall have the final say. The Contractor shall schedule a coordination meeting with the Owner and Consultant to coordinate actual project structure and naming prior to starting any programming.

3.04 INTRUSION REMOTE SOFTWARE PROGRAMMING

A. The Contractor shall configure Bosch RPS to utilize the Owner’s existing central SQL server. Coordinate requirements with the Owner prior to setting up.

B. The RPS software shall be set to run as a service on server startup.

C. The latest panel firmware shall be loaded in for centralized updating and all panels shall be on the same firmware version.

D. The Contractor shall create all required Owner RPS users.

E. The software shall be set to auto synchronize the time based on server time that is synchronized to the Owner’s NTP server.

F. The software shall be set to synchronize/receive panel data daily.

G. The software shall synchronize current panel events daily.

H. The Contractor shall set the panels Cloud ID in RPS to enable future Cloud functionality.

3.05 MONITORING SERVICE AND COMMUNICATIONS INTEGRATION

A. The Contractor shall program the intrusion panels to communicate to the Owner's preferred monitoring service which may be their own internal monitoring or an external service.

B. The Contractor shall program all applicable route groups for primary and backup using the appropriate communication formats accepted by the monitoring service. Radionics Modem 4 is preferred when possible. Set AES encryption where required.

3.06 MOTION DETECTOR INSTALLATION REQUIREMENTS

A. Point away from outside traffic. Position 360 detectors farther from walls. Microwave energy passes through non-metallic walls.

B. Point or position away from direct and indirect sunlight.

C. Point or position away from glass or other objects that rapidly change temperatures.

D. Point or position away from moving or rotating objects such as fans.

E. Mount the detector on a solid and vibration free surface.

F. Avoid mounting the detector within 1 ft (minimum) of any fluorescent light fixtures.

G. Long range, narrow angle detectors should be mounted in the center of hallways when possible.

H. Wide angle detectors should be mounted in corners of the areas being covered when possible.

I. Wide angle detectors mounted in spaces smaller than 25' x 33' should have the DIP switch set to reduce the coverage from the maximum.

J. Long range, narrow angle detectors mounted in corridors shorten than 3.3' x 25' should have the DIP switch set to reduce the coverage from the maximum.

K. Detectors should have the down lens enabled unless specifically noted otherwise.

3.07 END OF LINE SUPERVISION

A. The Contractor shall furnish and install end-of-line resistors to provide end-of-line supervision on all intrusion input devices. This shall include but is not limited to door position switches, motion detectors, glass break detectors, duress/panic buttons and all other inputs being monitored.

B. The Contractor shall furnish and install resistors as near to the field device as possible. Supervision resistance values shall be natively compatible with the associated control panel.

C. Bosch Security based installations shall utilize 1K resistors to provide a 1K / 2K ohm resistance values from associated inputs.

3.08 PASSWORDS

A. The Contractor shall coordinate a secure project password with the Owner and Consultant. This password shall be documented by the Contractor and used for all devices.

3.09 SYSTEM GROUNDING

A. The Contractor shall ground all components of the system to the telecommunications grounding system and ground fault detection shall be enabled according to UL requirements.

3.10 TESTING

A. Refer to Section 27 00 00 for additional requirements.

3.11 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

3.12 WARRANTY

A. Refer to Section 27 00 00 for additional requirements.

B. Contractor shall guarantee all materials, equipment, etc., for one (1) year from date of substantial completion of work. This guarantee shall include labor, material, and travel time.

C. All Intrusion Alarm systems, materials, and labor shall be under warranty for 1 year from date of final acceptance.

3.13 GENERAL

A. Prerequisites

1. The Contractor shall maintain a competent (single point of contact) project supervisor, along with competent technical personnel acceptable to the Owner and Consultant, during the entire installation process. Best efforts shall be made to avoid change of the project supervision during the project without prior written approval from the Owner and/or Consultant.

2. The Contractor installing any equipment/devices shall be responsible for providing all interconnecting cables to and/or between same equipment that may be required to make equipment fully operational.

3. The Contractor shall be a Bosch Expert or Master certified dealer.

4. The Contractor shall have a minimum of 3 certified technicians and shall have at least 5 years' selling and configuring the products specified herein.

B. Requirements and Responsibilities

1. The Contractor shall provide, furnish, deliver, transport, erect, install, configure, and connect completely all of the material and equipment described herein or depicted on project drawings. The Contractor shall supply all other incidental material required, such as interconnecting cables, to make the work complete and to install all systems in a turnkey operating condition.

2. Perform this work in accordance with acknowledged industry and professional standards and practices, existing build conditions, and as specified herein. Provide and install all materials, devices, components, and equipment for complete operational systems.

3. Coordinate all efforts and verify field conditions with those of related trades. In the event of any conflicts, delays, or improper preparatory work by others, notify the Owner or Owner's Consultant: The Owner and Owner's Consultant's decision will be binding.

4. The initial design shall not exceed 70% of the rated power supply and circuit capability.

3.14 INSTALLATION PRACTICES

A. All services provided shall be professional and conform to the highest standards for industry practices. The Owner and Owner's Consultant reserve the right to halt any installation due to poor workmanship. All work shall be defect free, and the installer shall replace, at their expense, any work found to be defective.

B. The Contractor shall exercise care during installation - damage to cables or equipment will not be accepted. The Contractor shall remove any damaged cabling or equipment and replace with new.

C. Contractor is responsible for providing a complete and functional intrusion alarm system.

D. Contractor shall provide low voltage power and control lines to and from power supplies, remotely controlled equipment, and other devices, even though not explicitly indicated on drawings or listed in equipment tables.

E. All manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by the manufacturers or as indicated in their published literature unless specifically noted herein to the contrary.

F. The Contractor shall follow these standards and approved submittals for locations of power supplies. The Owner intends to limit the number and location of power supplies to facilitate more effective long-term support and maintenance of the system.

G. Install plates as required on back boxes where they exist. Provide cut-in back boxes where boxes do not exist.

H. The Contractor installing any RF devices shall be aware that RF devices may cause interference to equipment and shall take whatever precautions necessary to avoid causing interference.

I. The Owner will provide programming information needed to help Contractor with configuration of system. The Contractor shall have the responsibility to program the system, assure proper communications between controlling points and any monitoring companies, and to adjust any system or device causing false alarm conditions.

J. Consideration shall be given not only to operation efficiency but also to overall aesthetic factors.

3.15 COORDINATION

A. Contractor shall provide up to 4 hours (up to two, 2-hour sessions) of scheduled and dedicated coordination time to assist Owner with sequence of operation, zone coordination, rule creation and coordination as requested by Owner or Consultant.

3.16 TRAINING

A. Provide system operations, administration, and maintenance training by factory-trained personnel qualified to instruct.

1. Contractor shall provide up to 4 hours of scheduled and dedicated training time in two (2) two (2) hour sessions for system use and maintenance.

2. Contractor shall provide up to 1 hours of scheduled and dedicated training time in two (2) thirty (30) minutes sessions for system arming and disarming per site.

3. Provide printed training materials for each trainee, including product manuals, course outline, workbook or student guides, and written examinations for certification.

4. Provide hands-on training with operational equipment.

5. Training shall be oriented to the specific system being installed under this contract as designed and specified.

6. Contractor shall provide all necessary documentation of system operating parameters prior to scheduled training sessions.

3.17 SUPPORT

A. The Contractor shall make available technical resources, as deemed necessary by the Owner, for database integration projects.

3.18 AESTHETICS

A. All cables terminating at the panel frames shall be vertically straight, with no cables crossing each other, from twelve inches inside the ceiling area to the termination block.

B. All cable bundles shall be combed and bundled to accommodate individual termination block rows and panels.

C. A horizontal and vertical alignment for all mounting hardware shall be maintained to provide a symmetrical and uniform appearance to the distribution frame.

D. All surface-mounted devices shall be firmly secured and level.

3.19 HARDWARE LAYOUT

A. Hardware positioning and layout shall be according to project drawings.

3.20 INSTALLATION

A. Contractor shall coordinate with the Electrical Contractor their requirements for conduits and proper AC power to service all equipment installed by Contractor in locations where power is not available.

B. Contractor shall provide for proper ground system to all equipment.

C. Each cable group that can cause interference to another group shall be separated by sufficient distance so as not to cause signal contamination or interference.

D. All external wire and cables shall be supported at least every five feet from the structure or as required to maintain not more than 12" cable sag between supports and without over tensioning the cables.

E. Support cables rigidly to the building structure with bridle rings and allowed attachments.

F. Grid wire hangers will not be accepted.

G. All cable supports system shall be secured to the building structure rigidly with threaded rods and beam clamps, and/or cables shall be secured and supported independently at both ends above suspended ceiling per NEC requirements.

H. Install no more than 15 motion detectors per wiring loop and / or no more than 3 wiring loops per expansion module.

I. Each motion sensor, door, push button shall utilize an individual addressable PoPIT zone module.

J. Each popit module shall have its own individual 4x4 j-box covered with a blank plate and labeled with Popit ID. Label ceiling grid with Popit ID and a green color dot next to it where the Popit module is located.

K. All cables, regardless of length, shall be marked with indelible color-coded labels within 3" of both ends with an identifier that is keyed to the door, room, or corridor number as identified. Labels shall be directly hot stamped or factory stamped, closed sleeve method. Adhesive strip labels may only be used if protected by transparent heat-shrink tubing. There shall be no unmarked cables at any place in any part of any system. Marking codes used on cables shall correspond and be shown clearly on as built drawings.

L. Each cable shall be marked at all cable ends with a standard nomenclature (Device, #, closet letter).

M. All cables shall be separated into like groups, according to signal or power levels, and routed separately to eliminate signal contamination and crosstalk - this includes both inside and outside of equipment racks.

N. All cables shall have 6-foot service loops neatly coiled in accessible ceiling at each motion device and at the MDF/IDF room. During initial cable rough-in, the Contractor shall have sufficient slack to route anywhere within Telecommunications Room. Coordinate exact panel and power supply mounting locations with Electrical Contractor.

O. Cabling shall be adequately supported with Velcro wire wraps fastened inside enclosure to rack frame. Velcro straps shall be installed snugly without deforming cable insulation. Cables shall be dressed in a neat and orderly fashion with magnetic cables tie mounts and magnetic mounting solutions. Any cabling or equipment installation that is deemed unacceptable by the Owner or Consultant shall be replaced or corrected by the Contractor at no additional cost.

P. Cable Ties shall be installed snugly without deforming cable insulation. Ties shall be spaced at uneven intervals, not to exceed four feet. No sharp burrs shall remain where excess length of the cable tie has been cut.

Q. All cables are to run at right angles to the structure, placed above the ceiling in halls or corridors.

R. Cables shall not run above red iron joist.

S. No AC wiring or any wiring shall be run in the same conduit as security alarm wiring.

T. Cable runs in conduit shall not exceed 40% fill ration per NEC.

U. Systems utilizing open wiring techniques with low smoke plenum cable shall provide conduit in all inaccessible locations, inside concealed walls, at all mechanical/electrical rooms, or other areas where wiring might be exposed or subject to damage.

V. 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 conductor’s traversing the respective box as well as the number of terminations required.

W. Contractor shall notify Owner or Owner’s Consultant immediately if obstruction or hazard is discovered in a pathway provided by others.

X. Cable shall be stored and handled to assure that it is not stretched, kinked, crushed, or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or

recommendations. Cable shall not be installed in ambient temperatures or moisture conditions above or below the manufacturer's rating.

Y. No splices shall be installed in any cable.

Z. Cable runs shall be Daisy chain.

AA. No security device cabling shall have an accessible disconnect outside of a secured equipment room or within a backbox.

BB. Data cable: Provide a 4-pair Category 6A cable from the Master Control Panel to the patch panel installed in 3/4" conduit.

CC. Any exterior exposed will be contained in waterproof conduit with the appropriate waterproof fittings.

DD. Burglar alarm wiring to be light or fluorescent green.

EE. Contractor shall make every effort to conceal wiring and other apparatus into walls, floors, and ceilings, assuming any applicable codes and good engineering practice allows and suggests.

FF. All cabling systems installed in public areas shall be installed within walls, ceiling, or floors or within surface wiring pathways as dictated by codes and good engineering practices.

GG. The cables shall be supported by properly insulated wire support hangers, bridal rings.

HH. Contractor shall seal any cable penetrations they may use or make where the penetration is part of a firewall or acoustic barrier.

II. All motion sensors to be installed no higher than 9 ft. from the ground.

JJ. Each Popit shall be installed near each motion detector.

KK. Each motion sensor shall be installed with a ceiling mount or wall mount bracket.

LL. Mount AC Duplex inside the Altronix Trove2BH2.

MM. A keypad shall be installed by the Alarm Control Panel with Hubbell HBL500 metal raceway series and a double gang shallow box.

NN. All keypads to be installed no higher than 54 in. AFF.

3.21 EQUIPMENT CABINET WIRE AND CABLE INSTALLATION

A. All power cables, control cables, and high level cables shall be grouped to one side of the equipment rack, while low level cables grouped to the other side.

B. All equipment rack wiring and cabling shall be neatly laced and ends dressed with heat shrink tubing, and all cables shall have service loops between the horizontal tie bar and the connection to equipment. Rack cabling shall be adequately supported with Velcro wire wraps and horizontal support bars to rack frame as it enters or exits the front or back of equipment.

C. Cables inside of enclosure shall be supported with magnetic cable ties mounts and magnetic mounting solutions.

D. All equipment rack wiring and cabling shall be neatly dressed.

E. Rack cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame.

F. Altronix power Supply cabinet shall be mounted to the right of Security Control Panel. Link both panels with a 6” long 3/4" conduit.

G. Mount AC duplex inside the Altronix power supply cabinet.

H. Install (2) 1" conduit and junction boxes at 90 degree turn from Alarm Control Panel (MDF room) or Power Relay Output cabinet (IDF room) into accessible ceiling space.

3.22 CONNECTORS/CONNECTIONS

A. Moisture Resistance: All connectors shall be crimped or applied in such a way as to prevent moisture from entering the connector or cable.

B. Preparation: Cables shall be carefully prepared and connectors installed as directed by the manufacturer. Proper stripping devices and crimping tools shall be used.

C. Terminations: Connectors shall be carefully fitted to mating devices on equipment to avoid damage to mating contacts, inserts, or bodies. Specialized terminations shall be made in a neat and secure manner, suited to the service of the wire, and as directed by the manufacturer. In all cases, where the manufacturer specifies the terminations, those terminations shall be used.

D. Termination Testing: The strength of the termination shall be tested by manually pulling on the connector and cable. Any terminations that exhibit movement, loose cable, or insecure connections shall be re-terminated.

3.23 SPECIAL TECHNIQUES

A. Waterproofing: Contractor shall be responsible for creating a waterproof seal in and around any openings the Contractor creates, or are created by others for use by Contractor, that enter or exist in a structure to the outside environment.

3.24 FIRE STOPPING

A. Fire stopping of openings between floors, fire-rated walls, and smoke-rated walls, created by others for the telecommunication Contractor to pass cable through, shall be the responsibility of the security Contractor. Sealing material and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work.

B. Any openings created by, or for Contractor, and left unused, shall be sealed up as part of this work by the telecommunication Contractor.

3.25 TEST REQUIREMENTS FOR DEVICE CABLING

A. Contractor shall perform continuity tests to ensure cables are free of shorts within the pairs, and shall verify cables for continuity, pair validity and polarity, and conductor position.

3.26 SYSTEM TESTING PROCEDURES

A. Prior to energizing or testing the system, ensure the following:

1. All products are installed in a proper and safe manner per the manufacturer’s instructions.

2. Dust, debris, solder, splatter, etc., is removed.

3. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

4. All products are neat, clean, and unmarred, and parts are securely attached.

B. Contractor shall ensure that each device in the security system is functioning normally and in such a manner as to meet the functional and performance requirements in this specification.

3.27 SYSTEM INSPECTION

A. Contractor shall coordinate with Consultant and Owner for inspection after Contractor has completed testing of entire system.

B. Contractor shall have trained Contractor representative and testing equipment on site during inspection to assist with spot verification of tests.

C. Contractor shall demonstrate to Consultant and Owner the functionality of the system, including the selection of various display modes and accessing system functions.

D. Contractor shall verify with Consultant and Owner the precise positioning of all devices and shall make fine adjustments as requested.

3.28 LABELING

A. Contractor shall neatly label all security devices and cabling at both ends. All labels shall be on project as-built drawings.

B. Contractor shall label both ends of the cable within four (4) inches of the termination with the same label identifier. These will be machine printed, Brady (or equivalent) labels.

C. Each Popit location shall be labeled on the ceiling grid with a green color dot next to it.

D. Panels shall have labels showing cable numbers and far end locations for each cable terminated in the cabinet.

3.29 DOCUMENTATION

A. Upon completion of the installation, Contractor shall provide full documentation sets to the Consultant for approval. All documentation shall become the property of the Owner.

B. Documentation shall include the items detailed in the subsections below:

1. Contractor shall provide hard copy and electronic forms of the final test results.

2. Contractor shall provide a document including the following:

a. Device label/identifier

b. Location of each device by room or corridor number

C. Contractor shall provide accurate as-built Construction Drawings. The drawings are to include cable routes and device locations.

D. Consultant will provide floor plans in paper and electronic formats (“.dwg,” AutoCAD and “.dxf”) on which as-built construction information can be added. The Contractor shall modify these documents accordingly to denote as-built information as defined above and then return the documents to the Owner.

3.30 FINAL ACCEPTANCE

A. The Contractor shall demonstrate the following before final approval.

1. Owner training is complete.
2. Punch list items are complete.
3. As-built documentation is complete and submitted to Owner/Consultant.

3.31 CLOSEOUT PROCEDURES

A. Closeout Submittals: Contractor shall provide closeout documentation to the Consultant. The Consultant shall receive the closeout submittals no less than 72 hours prior to the scheduled inspection time.

B. Inspection: Contractor shall be present for the inspection by the Consultant. Contractor shall supply all testing equipment needed to verify compliance with the specifications.

C. Punch List: Work or materials found to be incomplete, of unsatisfactory quality, failing to meet written system specifications, and/or unacceptable to the Consultant, shall be documented by the Consultant and provided to Contractor to rectify.

D. Re-Inspection: If a re-inspection is necessary, the costs of the Consultant's additional travel, hours, and expenses may be deducted by the Owner from the contract amount due Contractor.

E. Punch List Approval: The punch list shall be considered complete only after having been signed by the Owner and Consultant.

3.32 CLEANING

A. Prior to system final turnover to Owner:

1. Remove all dirt and debris from equipment racks and equipment rooms.
2. Clean all equipment filters, vents, and fans.
3. Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

End of Section

SECTION 28 13 16

ELECTRONIC ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. This specification section covers the furnishing and installation of additions to an existing Electronic Access Control System (EACS).

B. Contractor shall furnish and install access control hardware devices, mounting brackets, power supplies, switches, controls, consoles, and other components of the system as shown and specified, including arming/ disarming readers next to the intrusion keypads.

C. Contractor shall provide mock-ups of door and panel installation and have them approved by Owner prior to installation. A pre-construction meeting will also be required prior to any work on site.

D. Contractor shall schedule and attend 'OAC' meetings at minimum every other week throughout the duration of the project. Meeting minutes shall be maintained and submitted to Owner and consultant after each meeting.

E. Contractor shall furnish and install access control related software to allow this system expansion. Software includes required license addition for access control readers and electrified portals, workstations, and required physical security system integration.

F. Furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation. Requirements shall be in accordance with Division 26 00 00, Electrical.

G. The Contractor shall provide a satellite level screen shot map showing exterior devices. These maps shall include drill down links to access the building floor plans where all interior and exterior devices are shown. The overview satellite map shall show alarms signifying there is an alarm in the building to draw attention quickly to the correct building then floor plan.

H. The mapping software shall be licensed to use Microsoft Bing maps, Google Maps, or similar.

I. The maps shall have links to the other levels/sections as well as the global map.

J. All cameras shall show their approximate field of view.

K. The cameras shall change state when motion is detected.

L. The floor plans shall include all access controlled door intrusion and integrated devices such as cameras and intercom.

M. The Contractor shall be responsible to provide all the labor to setup these maps and place all the devices.

N. The Contractor shall get sign-off from the Owner and Consultant on the finished maps.

O. The Contractor shall obtain the building plans from the Consultant for their use.

P. Refer to Section 27 00 00 for additional project scope information.

Q. Hardware by Division 8

1.02 PRECEDENCE

A. Obtain, read and comply with General Conditions and applicable sub-sections of the contract specifications. Where a discrepancy may exist between any applicable sub-section and directions as contained herein, this section shall govern.

1.03 RELATED WORK

A. Division 08 - Door Hardware

B. Division 14 - General Elevator Requirements

C. Section 27 00 00 – General Technology Requirements

D. Section 27 05 00 – Communications General Requirements

E. Section 27 05 26 – Grounding and Bonding for Technology Systems

F. Section 27 05 28 – Pathways for Technology Systems

G. Section 27 05 37 – Firestopping for Technology Systems

H. Section 27 11 00 – Communications Equipment Rooms

I. Section 27 15 00 – Communications Horizontal Cabling

J. Section 27 16 00 – Communications Connecting Cords

K. Section 27 18 00 – Communications Labeling and Identification

L. Section 27 51 00 – Distributed Communications Systems

M. Section 27 60 00 – Physical Security General Requirements

N. Section 27 64 00 – Video Surveillance System

O. Section 27 66 00 – Intrusion Detection System

1.04 DEFINITIONS

A. ACS – Access Control System

B. IDS – Intrusion Detection System

C. VMS – Video Management System

D. Refer to Section 27 00 00 for additional definitions.

1.05 REFERENCE STANDARDS AND CODES

A. IEC 60839-11-5:2020 - Open Supervised Device Protocol (OSDP)

B. Refer to Section 27 00 00 for additional requirements.

1.06 QUALIFICATIONS

A. Lock installers for fire rated doors are to be trained and certified by the manufacturer via Intertek Qualified Personnel (IQP) Raceway and Hardware Installer Program on the proper

installation and adjustment of fire, life safety, and security products in compliance with NFPA 80, including: hanging devices; locking devices; closing devices; and seals.

B. Trained and qualified raceway installers are required to ensure modifications do not affect the integrity of fire doors. Doors must remain compliant with NFPA 80.

C. The manufacturer of all hardware and software components shall be an established vendor to the access control industry for no less than five (5) years and shall have successfully implemented at least five (5) systems of similar size and complexity.

D. Conduct visual inspection of all devices to verify proper assembly.

E. Conduct consistent and routine functionality testing on all devices prior to shipment from warehouse.

F. Stage all devices in a manner consistent with installation configurations to ensure all functionalities are tested.

G. The integrating contractor shall be Unified Elite certified by Genetec and shall have a minimum of three (3) certified technicians. The integrator shall have a minimum of five (5) years experience in designing and installing access control systems of similar size and scope.

H. Installing Contractor must have Texas DPS Security License with a Qualified Manager. All technicians working on site must be licensed through the State of Texas, either having an Electronic Access Control Device Installer license or an Alarm Systems Installer license (ref. Texas Department of Public Safety Statutes & Rules Sec. 1702.2226 & 1702.2223). All contractor technicians must carry on them their license pocket card and present it to Owner if requested.

1.07 PRE-CONSTRUCTION SUBMITTALS

A. The Contractor shall submit the access control hardware layouts which includes the number of controllers, sub-panels and other associated devices per location.

B. The Contractor shall submit full power calculations which includes the anticipated power loads, number and type of power supplies including all power supply boards, number of 120VAC circuits required, battery backup including the quantities of batteries to meet requirements, PoE loads, fire alarm connection requirements, etc.

C. Refer to Section 27 00 00 and 28 13 16 00 for additional requirements.

1.08 PRE-INSTALLATION PROCEDURES

A. For in-use, existing facilities or retrofit projects, the Contractor shall assign all applicable electronics IP addresses, passwords and pre-build out all the enclosures, including the interconnects within the enclosure, prior to being delivered to the project or installed.

B. The Contractor shall cable all controlled or monitored doors, intercoms, etc., and terminate this cable in the access control panels no less than 3 weeks prior to substantial completion regardless of the status of the field devices such as door hardware, card readers, intercoms, etc.

C. The Contractor shall program the access control system no less than 2 weeks prior to substantial completion so when field devices are installed and terminated, associated door hardware and full system functionality can be tested. Programming shall include all doors, associated inputs, outputs, and interoperability regardless of final field device status.

D. The Contractor shall perform final connections and testing onsite when field devices such as electrified door hardware has been installed.

E. Refer to Section 27 00 00 and 28 00 00 for additional requirementsConstruction Progress Submittals

F. Refer to Section 27 00 00 requirements.

1.09 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.10 CLOSEOUT SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Unless noted otherwise, products in this section are intended as a basis of design and are open to substitutions per the product substitution procedures defined in Section 27 00 00.

2.02 ELECTRONIC ACCESS CONTROL HARDWARE

A. The Access Control Panel (ACP) is used as the subcomponent to the security management system for the purpose of initiating all decision-making criteria as it relates to the cardholders, readers, and associated hardware connected. Decisions are made by the ACP and uploaded to the host computer as historical events.

B. The ACP shall be listed for Underwriters Laboratory (UL):

C. UL294 (Access Control System)

D. Provide an access control system based off of HID Mercury Security open platform hardware and interface modules. Each facility shall have (1) Synergis CloudLink G2 installed at the access control panel in or nearest the MDF room. The panels shall:

1. Operate without the need for the host to be on-line. No decisions shall be dependent on the host.
2. Support on-board 10/100 Ethernet communications to the host as primary communication.
3. Include a request-to-exit and door status contact input for each reader without the need for additional modules for future use.
4. Detect “forced entry” and “door left open.” A separate action is required for each.
5. Detect request to exit, lockdown, and latchbolt monitor inputs (where lock type provided allows for LBM - new construction).
6. Allow mapping of readers to any output address within the same controller.
7. Support at least 50 user-selected holidays.
8. Allow all unused door logic, such as door strike relays, request-to-exit inputs, and door status inputs, to be assigned as general-purpose points.
9. Support optional modules for additional customization of inputs and outputs.

10. Wireless intelligent lock support.
11. Wired intelligent lock support.
12. Elevator support.
13. Maintain historical information for a minimum of three (3) months without AC power.
14. Automatically adjust for daylight savings time and leap year.
15. Support a variety of reader technologies.
16. Support for OSDP V2 and OSDP V2 SC (Secure Channel).
17. Support the following card/reader technologies as a minimum:
    a. Magnetic Stripe
    b. 125KHz Proximity cards
    c. 13.56Mhz Smart Cards and technologies
    d. Biometrics
    e. Vehicle Identification
    f. Support multiple technologies simultaneously.
    g. Support for HID 37-bit card formats.
    h. Support for HID iClass SE and Seos technologies.
    i. Support for NXP and HID MiFare DESFire EV1, EV2, and EV3
18. Maintain the expiration date for each cardholder. Once the date is reached, the card will automatically be disabled. No access shall be authorized.
19. Maintain three (3) access times for each door location: Standard, Long, and Egress.
20. Have the ability to maintain an automatic door unlock during specific hours and days.
21. Support a minimum of (2) “levels” of Anti-Passback: Global and Area.
22. All controllers and expansion modules shall have the latest ACS recommended firmware installed and shall have matching firmware versions. The Contractor shall provide all necessary firmware upgrades to keep the Owner on the latest version throughout the duration of the project. At the completion of the project, the Owner and Representatives shall have the option to receive a final firmware update the latest version before the project is paid in full.

E. Panels shall use HID Mercury Security LP controllers with Series-3 MR interface panels. Legacy EP controllers and Series-2 interface panels are not allowed.

F. The Contractor shall provide adequate number of access control panels, controllers, door interface panels, and I/O panels for a complete turnkey system to support all components as indicated on project drawings, specifications, and as required.

G. Head End panel locations shall have sufficient reader ports, inputs, outputs, and power at time of install to account for 20% future expansion.

H. Basis of design is LP1502 controllers and or MR52-S3 sub controllers.

1. LP1501 single door controllers shall only be used when specifically specified or approved by the Consultant. MR50 single door expansion modules shall not be utilized.
2. For RS-485 based intelligent lock installations, expansion module star topologies, or complex installations requiring significant RS-485 connection, the Contractor shall utilize Mercury Security MUX8 RS-485 multiplexers.
3. Mercury Security Series-3 LP1502 Controller:
    a. Power Input Direct Current (12-24VDC) ±10% 500 mA maximum.
    b. Power Output: 12 Volts DC at 650mA, including reader and AUX output.
    c. Reader Interface: 12-24VDC ±10%. PTC limited to 300mA maximum per reader.
    d. Inputs: Eight general purpose programmable circuit type and dedicated tamper.
    e. Outputs: Four relays – Form-C, 2 Amp, 30 volts direct current
    f. Onboard Reader Ports: Supports 4 readers on up to 2 openings.
    g. RS-485 Bus: (1) RS-485 bus.
    h. OSDP Secure Channel support.
    i. LED: TTL, two wire or one wire bi-color support
    j. Buzzer: One-wire LED mode
    k. Supports up to 128 OSDP readers on up to 64 openings with downstream modules.
    l. Supports up to 520 inputs and 516 outputs with downstream modules.
    m. 240,000 cardholder capacity.
    n. 2gb to 8gb MicroSD card support.
    o. Dimensions: 8”W x 6”H x 1”D.
4. Provide with Mercury Security Series-3 MR52 or other SIO modules as necessary for the application when Mercury controllers are utilized.
5. Provide with an appropriate, lockable enclosure to house the controller as well as the terminations and any expansion modules.
6.

2.03 ACS SYSTEM SOFTWARE

A. Genetec Security Center software is existing. Contractor to provide sufficient licensing for all Database controllers and sub-controllers installed as part of this project.

2.04 ACS SERVER FAILOVER REQUIREMENTS

A. Failover servers are existing in Owner’s VM environment.

2.05 ACS CLIENT SOFTWARE

A. Logging into the client software shall be done via Microsoft Active directory and enables features based on user roles and privileges.

B. The look and feel of the interface shall be customizable on a per user basis and enabled on log-in.

C. The software shall include a reporting interface to view historical events based on activity. The user shall be able to perform actions such as generating and printing a report and troubleshooting a specific event from the reporting view. The user shall be able view audit trails that show a history of user and administrator changes.

D. The software shall support graphical maps with multiple hierarchies to facilitate navigation within and between various sites and buildings. The Contractor shall set up these maps to include all cameras and integrated devices like video surveillance, access control, intercom and intrusion detection.

E. The software shall support the following additional minimum capabilities:

1. Monitoring the events from a live security system.
2. Monitoring and acknowledging alarms.
3. Creating and editing incidents and generating incident reports.
4. Executing actions from a dynamic graphical map and floor plan.
5. Management and execution of hot actions and macros.
6. Customizable display tiles with drag and drop capabilities.
7. The software shall support a minimum of 6 active displays.
8. Intercom with duplex audio through integrated intercom system or camera equipped with or connected to a microphone and speaker.

F. The Contractor shall provide, install and configure client software on the following computers. The Contractor shall coordinate with the Owners to determine privileges. The Contractor shall provide the Owner with recommended workstation/laptop performance levels early in the project so they may evaluate if hardware updates are required to their existing workstations.

G. The system shall be capable of a minimum of 4500 concurrent users including alarm management users.

2.06 ACS WEB CLIENT

A. The web client shall be a true HTML5 thin client with no download required.

B. The Contractor shall provide any mobile web servers and licenses required to support this functionality.

C. The web client shall support the latest versions of the following browsers:

1. Microsoft Edge
2. Google Chrome
3. Mozilla Firefox
4. Apple Safari

D. The web client shall support Microsoft Active Directory integration.

E. The system shall be capable of a minimum of 2300 concurrent web users.

2.07 ACS MOBILE CLIENT APP

A. The Contractor shall provide any mobile web servers and licenses required to support this functionality.

B. The mobile client shall support the following operating systems:

1. Apple iOS

2. Google Android

C. The mobile client shall support the following minimum functionalities:

1. Remote alarm monitoring and acknowledgment.

2. Door lock/unlock.

D. The Contractor shall provide, install and configure mobile client software apps on up to 1500 mobile devices of the Owners choosing.

E. The system shall be capable of a minimum of 1500 concurrent mobile users.

2.08 ACS HEALTH MONITOR

A. Health monitoring software is existing on Owner’s ACMS environment.

2.09 MAPPING SOFTWARE

A. The ACS software shall be provided with native integrated mapping software.

B. The mapping software shall be compatible with PDF, JPEG, and PNG.

C. The Contractor shall provide a satellite level screenshot map showing exterior devices. These maps shall include drill down links to access the building floor plans where all interior and exterior devices are shown. The overview satellite map shall show alarms signifying there is an alarm in the building to draw attention quickly.

D. The Contractor shall be responsible to provide all the labor to setup these maps and place all the devices.

E. The Contractor shall get sign-off from the Owner and Consultant on the finished maps.

F. The Contractor shall obtain the building plans from the Consultant for their use.

2.10 STANDALONE CARD DESIGN AND PRODUCTION SOFTWARE.

A. Install the full management studio version of SQL Express on an Owner furnished virtual server. Provide a full SQL server license according to the manufacturer’s recommendations.

B. Provide integration to the Owner’s Active Directory/LDAP.

C. Provide with encoding and management module compatible with the badge printers encoding module.

D. Magnetic stripe encoding compatible with badge printer’s mag stripe encoding module.

E. Customizable interface by user permissions.

F. Fully compatible with ODBC import/export.

G. Integrated signature capture from TWAIN, WIA, and DirectShow compatible devices.

H. Linear and 2D bar codes support and generation for PDF417, QR Code, and Datastripe.

I. Integrated photo capture from TWAIN, WIA, and DirectShow compatible devices.

J. Integrated fingerprint enrollment with Lumidigm fingerprint sensors

K. Support dual-sided template and printing designs

L. Compatible with Fargo, Datacard, DIS, Evolis, Nisca and Zebra card printers.

M. The Contractor shall provide a live link to the following databases:

1. Access control system

N. The Contractor shall provide all licenses required to integrate to the access control system including licensing on the access control system.

O. Support for access levels from access control system. Users shall be able to assign a credential and access level from the badging software interface.

P. The Contractor shall coordinate with the Owner for SSL certificates for secure linking to the access control system and other databases.

Q. Provide with 2 years of support.

R. Manufacturer:

1. HID Asure ID Exchange.
2. Or approved equal.

2.11 Electronic Access Control Server

A. The servers shall be Owner furnished virtual servers.

2.12 WORKSTATIONS

A. Workstations will be Owner furnished and installed. The Contractor shall install the software on the Owner’s workstations as required.

B. The Contractor shall provide the Owner with minimum workstation configurations and operating system requirements for the remote workstations and the master workstation.

2.13 CONTACTLESS 13.56 MHZ SMART CARD READERS

A. 13.56 MHz Supported Credentials:

1. Schlage
2. Mifare DESFire EV1/EV2/EV3, Classic
3. Able to read 37-bit card format support with no facility code.
4. NFC based credentials
5. 2.4 GHz based Bluetooth credentials
6. Apple Enhanced Contactless Polling (ECP) capable

7. OSDP V2 enabled with secure channel.

B. The Contractor shall supply with (2) 120 Ohm end of line resistors for controller side and final reader side of the OSDP bus.

C. Adjustable OSDP Baud rate from 9,600 to 115,200. The contractor shall set the card readers to communication at a minimum of 38,400 Baud rate. The default 9,600 is not acceptable.

D. Wiegand enabled with OSDP V2 support with secure channel.

E. Provide with integrated keypad where shown or required.

F. Operating voltage: 12 VDC

G. Current draw: 65mA average and 250mA peak @ 12VDC.

H. Color: Black with Silver Bezel

I. UL294 Outdoor and Indoor rated and IP65 rated.

J. With attached pigtail

K. Typical read range of 1.6” to 4”.

L. Provide adapter plate to mount on a single-gang mud ring as required.

M. Firmware upgradable via OSDP, HID reader manager or pre-programmed cards.

N. Provide the ability to transmit an alarm signal via OSDP or an integrated dry contact optical tamper switch if an attempt is made to remove the reader.

O. An audio beeper and RGB light bar shall provide various tone and light sequences to signify: access granted, access denied, power up, and diagnostics.

P. Card readers shall be Schlage MT15 for standard applications and Model MT11 for mullion/jam applications.

Q. Card readers with integrated keypad shall be Schlage MTK15.

R. Card readers with integrated Bluetooth and OSDP support shall be Schlage MTB15 for standard applications and MTB11 for mullion applications.

S. Card readers with integrated keypad, Bluetooth, and OSDP support shall be Schlage MTBK15.

2.14 CONTACTLESS 13.56 MHZ SMART CARD AND 125 KHZ LEGACY CARD MULTICLASS READERS

A. 13.56 MHz Supported Credentials:

1. HID Seos, iClass SE, iClass SR and iClass with Secure Identity Object (SIO)

2. Mifare DESFire EV1/EV2/EV3, Classic

3. Able to read 37-bit card format support with no facility code.

4. NFC based credentials

5. 2.4 GHz based Bluetooth credentials

6. Apple Enhanced Contactless Polling (ECP) capable

B. 125 KHz Supported Credentials:

1. HID Proximity
2. Indala Proximity
3. AWID Proximity
4. EM Proximity

C. OSDP V2 enabled with secure channel

1. The Contractor shall supply with (2) 120 Ohm end of line resistors for controller side and final reader side of the OSDP bus.

D. Adjustable OSDP Baud rate from 9,600 to 115,200. The contractor shall set the card readers to communication at a minimum of 38,400 Baud rate. The default 9,600 is not acceptable.

E. Wiegand enabled with OSDP V2 support with secure channel.

F. Provide with integrated keypad where shown or required.

G. Operating voltage: 12 VDC

H. Current draw: 65mA average and 250mA peak @ 12VDC.

I. Color: Black with Silver Bezel

J. UL294 Outdoor and Indoor rated and IP65 rated.

K. With attached pigtail

L. Typical read range of 1.6” to 4”.

M. Provide adapter plate to mount on a single-gang mud ring as required.

N. Firmware upgradable via OSDP, HID reader manager or pre-programmed cards.

O. Provide the ability to transmit an alarm signal via OSDP or an integrated dry contact optical tamper switch if an attempt is made to remove the reader.

P. An audio beeper and RGB light bar shall provide various tone and light sequences to signify: access granted, access denied, power up, and diagnostics.

Q. Manufacturer:

1. Card readers shall be Schlage MT15 for standard applications and Shlage MT11 for mullion/jam applications.
2. Card readers with integrated keypad shall be Schlage MTK15.
3. Card readers with integrated Bluetooth and OSDP support shall be Schlage MTB15 for standard applications and Schlage MTB11 for mullion applications.
4. Card readers with integrated keypad, Bluetooth, and OSDP support shall be Schlage MTBK15.

2.15 BADGES, FOBS AND CREDENTIALS

A. Provide 200 smart card credentials with the following features:

1. Operating Frequency: 13.56 MHz
2. Microprocessor based
3. 8k Byte application area
4. Composite material printable on both sides.
5. Standard CR-80 size, 30 mil thick.
6. Programmable Magnetic stripe on back.
7. Sequential matching internal/external laser engraved numbering.
8. 37-bit format with no facility code
9. Provide with clear card holder and lanyard with clip for each card.
10. Lifetime warranty.
11. The credential shall be Schlage EV3 Credential, procured using the Owner's CardTrax account.
    a. No substitutions.

2.16 SURGE PROTECTION FOR WIEGAND COMMUNICATION

A. The Contractor shall provide a surge protector for all exterior card readers not directly attached to a building which would include any pedestal mounted reader, gate reader or any other exposed reader potentially prone to surges.

B. Mount unit outside of the access control/power supply panels. Provide with appropriate mounting and enclosures as required.

C. There shall be a minimum of a 36" shielded cable from the surge protector to the device to allow for adequate clamping time.

D. When protector is mounted in interior, dry or weather sealed enclosure:

1. Nominal voltage rating of 12V AC/DC. Provide correct module per required voltage level if different from 12V.
2. 20,000A surge current rating.
3. Protects 2-pair per module.
4. Accepts up to 10AWG cable
5. Connect directly to ground.
6. UL 497B listed
7. Provide quantity of modules as required for the application.
8. Provide base mounting plate as required for the application.
9. Manufacturer:
    a. Ditek DTK-2MB Mounting Base

b. (2) Ditek DTK-2MHLP12B Surge Modules

c. Or approved equal

2.17 SURGE PROTECTION FOR OSDP/RS-485 DATA AND POWER BUS

A. The Contractor shall provide a surge protector for all OSDP/RS-485 data/power bus applications that run underground or through an area with high surge risk.

B. Mount unit outside of the power supply/control panels. Provide with appropriate mounting and enclosures as required.

C. There shall be a minimum of a 36” of cable from the surge protector to the device to allow for adequate clamping time.

D. When protector is mounted in interior, dry or weather sealed enclosure:

1. Nominal voltage rating of 12V AC/DC. Provide correct module per required voltage level if different from 12V.

2. 20,000A surge current rating.

3. Protects 2-pair per module.

4. Accepts up to 12 AWG cable

5. Connect directly to ground.

6. UL 497B listed

7. Provide quantity of modules as required for the application.

8. Provide base mounting plate as required for the application.

9. Manufacturer:

a. Ditek DTK-MB10 Mounting Base, upsize as required if multiple modules are required.

b. Ditek DTK-2MHLP12F Surge Module, (1) per 2-pair

c. Or approved equal

2.18 SURGE PROTECTION FOR LOW VOLTAGE AC/DC POWER

A. The Contractor shall provide a surge protector for all exterior devices being supplied by low voltage power. This does not include devices directly connected to a building where the risks of surges are negligible.

B. There shall be a minimum of a 36” shielded cable from the surge protector to the device to allow for adequate clamping time.

C. When protector is mounted in interior, dry or weather sealed enclosure:

1. Nominal voltage rating of 24V AC/DC. Provide correct module per required voltage level if different from 24V.

2. 20,000A surge current rating.

3. Protects 2-pair per module.

4. Accepts up to 10AWG cable

5. Connect directly to ground.

6. UL 497B listed
7. Provide quantity of modules as required for the application.
8. Provide base mounting plate as required for the application.
9. Manufacturer:
    a. Ditek DTK-2MB Mounting Base
    b. Ditek DTK-2MHLP24B Surge Module
    c. Or approved equal

2.19 POWER SUPPLIES AND ACCESS CONTROL ENCLOSURES

A. Provide a power supply/chargers and sub-assemblies to power various access controller boards, locking hardware and other access control or security system components. The Contractor shall select the appropriate enclosure, power supply and sub-assemblies for each application. The Contractor shall include network monitoring modules for all power supplies.

B. Enclosures

1. Shall be capable of accommodating power supplies, sub-assemblies and other manufactures access control controller boards when required.
2. Wall mountable.
3. Include a cam-lock and tamper switch.
4. Include with rocker switches to control power to the power supplies.
    a. Trove 1 or 2 enclosures to house access control electronics along with power supply and distribution components.

C. Batteries

1. The Contractor shall provide a minimum of (2) 12V, 7ah, sealed Absorbent Glass Mat (AGM) style batteries with F style terminals per 24VDC power supply and (1) 12V, 7ah per 12VDC power supply.
2. Provide adequate battery backup as required by Authority Having Jurisdiction (AHJ) or a minimum of 4-hours.
3. Manufacturer:
    a. Interstate Power Patrol FAS1075
    b. Power Sonic PS-1270
    c. Or approved equal

D. Sub-Assemblies

1. The Contractor shall provide all sub-assemblies to meet the project requirements
2. Access Control Module
    a. Independently controlled fused protected outputs:
        i. Fail-Safe and/or Fail-Secure power outputs.
        ii. Dry form “C” 5 amp rated relay outputs (fused).

iii. Any combination of the above

3. Access Control System trigger inputs:
    a. Normally open (NO) inputs.
    b. Open collector sink inputs.
    c. Any combination of the above.
4. Fire Alarm Disconnect:
    a. Individually selectable for any or all outputs.
    b. Latching or non-latch input FACP disconnect.
    c. Normally open (NO), normally closed (NC) dry contact or polarity reversal from FACP signaling circuit trigger input.
    d. LED indicates that the Fire Alarm Disconnect has been activated.
    e. Form “C” relay output for auxiliary reporting.
5. Multi-Output Power Distribution Module
    a. Single input distributed over eight (8) outputs.
    b. Fused protected outputs.
    c. Output terminals shall accommodate up to 12AWG wires.
6. Multi-Output Power Distribution Module with Dual Inputs
    a. Two (2) inputs distributed over eight (8) outputs.
    b. Outputs shall be configurable by input.
    c. Fused protected outputs.
    d. Output terminals shall accommodate up to 12AWG wires.
7. Network communication modules
    a. Power Supply Network Interface
        i. Interface for up to two (2) eFlow power supply/chargers.
        ii. Two (2) Network controlled From “C” relays.
        iii. Event timers.
    b. Network Power Distribution Module
        i. Two (2) inputs distributed over eight (8) outputs.
        ii. Outputs shall be configurable by input.
        iii. Fused protected outputs.
        iv. Emergency disconnect interface by output.
        v. Selectable battery back-up by output.
        vi. Output terminals shall accommodate up to 12AWG wires.
    c. Common monitoring features
        i. Network interface via LAN/WAN.

ii. Centralized dashboard for monitoring all power supplies. Provide appropriate hardware/software required.

iii. Remote reporting of status via email and/or SNMP trap messaging.

iv. AC, low battery and battery presence monitoring.

v. Alert messages of System Service required.

vi. System log.

vii. On demand determination of system status.

viii. Reset of individual outputs as required for remote diagnostics.

ix. Monitor enclosure temperature.

x. Static or DHCP IP address configuration.

xi. SSL Secure Sockets Layer encryption.

8. Voltage Regulator

   a. The Contractor shall provide a voltage regulator to provide constant 5VDC or 12VDC outputs for access control boards, modules or other applicable components as well as a voltage regulator for door hardwiring or controllers requiring 12VDC.

   b. 24vdc Input.

   c. Selectable 5 or 12VDC output.

   d. Output rating of 6amp max.

   e. Stackable with both Networkable and dual input power distribution modules for space savings.

9. Power supplies and sub-assemblies shall be manufactured by Altronix or approved equal:

   a. eflow4NB - 4amp 12vdc/24vdc power supply (UL listed Sub-assembly).

   b. eFlow6NB - 6amp 12vdc/24vdc power supply (UL listed Sub-assembly).

   c. eFlow104NB - 10amp 24vdc power supply (UL listed Sub-assembly).

   d. ACM8 - Eight (8) output, fused Access Control Module (UL listed Sub-assembly).

   e. ACMS8 – Dual input, eight (8) output, fused Access Control Module (UL listed Sub-assembly).

   f. Linq2 - Network Communication Module (UL listed Sub-assembly).

   g. Linq8PD - Dual input, eight (8) output, fused Network Communication Module (UL listed Sub-assembly).

   h. PDS8 - Dual input, eight (8) output, fused power distribution module (UL listed Sub-assembly).

   i. VR6 - Voltage Regulator (UL listed Sub-assembly).

   j. RSB2 – Rocker switches with mounting bracket.

2.20 SECURITY LOCKING DEVICES

A. This Section Not Used

2.21 CABLING

A. Provide cabling per manufacturer's recommendations and code requirements for riser rated, plenum, and non-plenum cable types.

B. UTP data cabling required will be provided, installed, terminated and tested by the Division 27 structured cabling Contractor.

C. UTP patch cables will be provided and installed by the Owner in the IDF and provided by Owner and installed by Contractor at the door. The EACS Contractor shall provide the Owner a list of patch cable lengths at the door side.

D. Wiegand cables for electronic access-controlled doors shall be a composite bundled cable and include the following cables and conductor counts:

1. Card reader, Wiegand – 6 conductor, 22 awg shielded.
2. Lock power – 4 conductor, 18 awg unshielded.
3. Door contact – 2 conductor, 22 awg unshielded. Furnish and install a second 22 awg, 2-conductor cable when the door contact connects to both the access control system and intrusion detection system.
4. Request to exit and/or latch detection/spare – 4 conductor, 22 awg unshielded
5. Manufacturer (Wiegand):
    a. Belden (Wiegand) #658AFS
    b. General Cable (Wiegand) #4EPL1S
    c. Superior Essex (Wiegand) #AC-A1x-68
    d. West Penn #AC251822B
    e. Or approved equal

E. OSDP cables for electronic access-controlled doors shall be a composite bundled cable and include the following cables and conductor counts:

1. Card reader, OSDP – 2 conductor stranded, twisted, 24 awg, 100% foil shield with 90% tinned copper braid shield with drain, 120 ohm nominal impedance, 12.5 pF/ft capacitance, designed for RS-485.
2. Card reader power - 2 conductor, 18 awg unshielded, may be within same jacket as card reader cable.
3. Lock power – 4 conductor, 18 awg unshielded. Provide larger 16-awg when required due to distances and current draw.
4. Door contact – 2 conductor, 22 awg unshielded. Furnish and install a second 22 awg, 2-conductor cable when the door contact connects to both the access control system and intrusion detection system.
5. Request to exit and/or latch detection/spare – 4 conductor, 22 awg unshielded
6. Manufacturer (OSDP):
    a. Sterling Wire and Cable - #SWC-8920A (Basis of design with 16-awg lock conductors)

b. Paige Datacom - #236700807

c. Remee Wire & Cable - #725937

d. Windy City Wire - #4461030-OSDP

e. Or approved equal

F. Cables for RS-485/OSDP in panel or in-panel controller shall be: 2 conductor stranded, twisted, 24 awg, 100% foil shield with 90% tinned copper braid shield with drain, 120 ohm nominal impedance.

1. Manufacturer:

a. Belden #82841

b. Or approved equal

G. RS-485/OSDP cables for electronic access-card reader only doors not requiring composite cabling such as secondary/daisy-chained OSDP card readers, remote controllers or RS-485 based intelligent locks, hubs or gateways shall be:

1. Card reader, OSDP – 2 conductor stranded, twisted, 24 awg, 100% foil shield with 90% tinned copper braid shield with drain, 120 ohm nominal impedance, designed for RS-485.

2. Card reader/Device power - 2 conductor, 18 awg unshielded

3. Manufacturer (OSDP):

a. Belden 6381MD

b. Sterling Wire & Cable # S182241PRS-10

c. West Penn # 1PR2418P

d. Or approved equal

H. Exterior OSDP cables for exterior electronic access-card reader only doors not requiring composite cabling shall be:

1. Card reader, OSDP – 2 conductor stranded, twisted, 24 awg, 100% foil shield with 90% tinned copper braid shield with drain, 120 ohm nominal impedance, designed for RS-485.

2. Card reader power - 2 conductor, 16 awg unshielded

3. Manufacturer (OSDP):

a. West Penn # 1PR485D+

b. Or approved equal

I. Cables for controlled doors shall be 16-guage, 2-conductor, unshielded, stranded cable per controlled door. The cable shall be white in color and plenum rated.

J. Cables for intercom trigger wires, door release buttons, and panic/lockdown buttons shall be 18-gauge, four-conductor, unshielded, stranded cable. The cable shall be white in color and plenum rated.

K. Cables for intercom trigger wires or door contacts shall be 18-gauge, four-conductor, unshielded, stranded cable. The cable shall be white in color and plenum rated.

L. Cables for magnetic door hold opens shall be 18-gauge, two-conductor, unshielded, stranded cable. The cable shall be white in color and plenum rated.

M. Cables for key switches shall be 18-guage, 4-conductor, unshielded, stranded cable. The cable shall be white in color and plenum rated.

N. Cables for emergency strobes shall be no smaller than 18-guage and shall be increased in size up to 12-guage as voltage drop, distance and the total circuit capacity requires.

O. Cables for PoE locks shall be installed by the Division 27 cabling contractor. Horizontal cable shall be terminated above the door within a j-box to provide a disconnect point for the patch cable to the PoE hinge.

2.22 DOOR CONTACTS/DOOR POSITION SWITCHES (DC)

A. All doors with card readers and all doors shown for monitored only shall have a door position switch. When the door position switches are not shown in the Division 08 specifications, the security contractor shall furnish and install them. The Security Contractor shall be responsible for the connection of all door position devices to the access control system and other systems if sharing the same door position switch. Door position devices shall be integral to the door hardware whenever possible. The Contractor shall refer to the door hardware schedule and coordinate with the door hardware Contractor on locations and requirements.

B. Sealed and potted magnetic reed switch in contact housing.

C. Provide DPDT for applications with multiple security systems (Access Control/Intrusion Detection) utilizing a single door contact.

D. Door contacts shall be appropriately sized for any established holes within door frames.

E. Parts provided are basis of design. Determination of final part number is the responsibility of Contractor.

F. Provide color that matches door as close as possible.

G. Provide recessed switch whenever possible.

H. Provide armored whip for surface mount contacts.

I. Provide with a 1k/2k end of line (EoL) pre-built resistor pack. GRI (George Risk Industries, Inc.) 6644 series or approved equal.

J. Provide GRI (George Risk Industries, Inc.) 180 Series for recessed applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

K. Provide GRI (George Risk Industries, Inc.) 4400 series for surface mount applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

L. Provide GRI (George Risk Industries, Inc.) MC-180 Series for hollow top channel applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

M. Provide GRI (George Risk Industries, Inc.) 4532 Series for overhead door applications.

1. Magnasphere
2. Nascom
3. Or approved equal.

2.23 REQUEST TO EXIT (REX) DEVICES

A. All doors with card readers shall have a request to exit with the exception of doors with a card reader in and a card reader out. When integrated request to exit devices are not shown in the Division 08 specifications, the security contractor shall furnish and install motion-based request to exit devices. The Security Contractor shall be responsible for the connection of all requests to exit devices integral to the door, motion based or other to the access control system. Request to Exit devices shall be integral to the door hardware whenever possible. The Contractor shall refer to the door hardware schedule and coordinate with the door hardware Contractor on locations and requirements. Motion based Request to Exit devices shall only be used when not available in the door hardware.

B. Provide with a 1k/2k end of line (EoL) pre-built resistor pack when utilized to release doors with magnetic locks or other high security applications. GRI (George Risk Industries, Inc.) 6644 series or approved equal.

C. Independent adjustable beam pattern.

D. Provide with mounting plate or wall mounting plate to mount over a single-gang backbox when required.

E. Provide white or black color that matches door as close as possible.

F. (2) Form C relay contacts each rated 1 A at 30 VAC or VDC for resistive loads.

G. DC Power draw: 39mA max @ 12 VDC.

H. Dimensions: 1.8”H x 6.75”W x 1.75”D.

I. Utilize contact closure REX hardware built into the handle or crashbar whenever possible.

J. Provide Bosch DS160/161

1. Provide with TP160/161 mounting plate when mounted over a backbox.
2. Or approved equals.

2.24 DOOR RELEASE BUTTON, UNDER COUNTER

A. SPDT, momentary push button

B. Coordinate exact mounting location after deck or counter is fully complete and the sitting position has been decided.

C. Manufacturer:

1. Rutherford Controls (RCI) 909S-MO

2.25 PANIC/DURESS/LOCKDOWN BUTTONS

A. Exact device type and style to be coordinated with Owner prior to approval or purchase. A selection of button options shall be presented to the Owner for review.

B. Button shall be hardwired.

C. Provide with a 1k/2k end of line (EoL) pre-built resistor pack. GRI (George Risk Industries, Inc.) 6644 series or approved equal.

D. Buttons within a single space may be wired in parallel and be programmed as a zone.

E. Manufacturer:

1. Switch 909S-MO

a. Electric Strike Rocker Switch, Momentary, Under Mount, C-Contact Surface-mount: 2-7/16"W X 2-7/16"H x 7/8"

2. Wall push type – STI-USA Stopper Station #SS2432LD-EN

a. Blue, flush cover, latching with key to unlock, Text = LOCKDOWN. Coordinate exact text to use with Owner prior to purchase. Provide with appropriate power supply connection for illumination.

3. Lockdown Button

a. STI SS2305LD-EN

b. Lockdown cover 13220NW

2.26 EMERGENCY ALERT STROBES

A. Furnish and install strobes where required and shown.

B. Selectable amber, blue, or green lens color. Lens shall Blue. Lens shall not be red or conflict with the facilities fire alarm strobes.

C. Lettering on strobe shall read: Alert.

D. Wall mount and ceiling mount versions.

E. Field selectable candela settings of 15, 19, 30, 75, 95, 110, 135, 185 candela for wall mount and 15, 30, 60, 75, 95, 115, 150, 177 candela for ceiling mount.

F. Product 1 flash per second.

G. Requires 24 VDC

H. Current draw from 0.057A at 15 candela up to 0.253A at 185 candela.

I. Furnish and install the appropriate end of line resistor.

J. UL 1638 listed.

K. Provide with power supply and synchronization module or power supply with integrated synchronization module.

L. Manufacturer:

1. Cooper Wheelock Exceder strobes with lettering
2. Or approved equal

2.27 EMERGENCY ALERT STROBE POWER SUPPLY

A. Furnish and install a UL 1481 listed NAC power supply with integrated strobe synchronization where emergency alert strobes are required.

B. 8-amp power supply

C. Integrated strobe synchronization

D. Panel to panel synchronization

E. Ground fault detection

F. Aux outputs for AC fail and trouble

G. Black enclosure. Enclosure shall not be red.

H. Provide with (2) batteries for 24 VDC battery backup.

1. The Contractor shall provide a minimum of (2) 12V, 7ah, sealed Absorbent Glass Mat (AGM) style batteries with F style terminals per power supply.
2. Provide adequate battery backup as required by Authority Having Jurisdiction (AHJ) or a minimum of 4-hours.
3. Manufacturer:
    a. Interstate Power Patrol FAS1075
    b. Power Sonic PS-1270
    c. Or approved equal

I. Manufacturer:

1. Cooper Wheelock PowerPath PS-8-B-LP
2. Or approved equal

2.28 MAGNETIC DOOR HOLDS

A. The Security Contractor shall be responsible for the connection of all electrified magnetic door hold open intended for security to the access control system. This shall include providing centralized power supplies located next to or integral to the access control panels when required for standalone operation, connecting to the fire alarm system for interface, or interrupting directly at the mag hold with a relay to interrupt power locally. The Contractor shall coordinate with the door hardware specifications, schedules and fire alarm drawing/specifications for additional information.

B. Die cast housing

C. Mounting options include:

1. Floor-mounted
2. Recessed wall-mounted

3. Surface wall-mounted

D. 35 pound holding force

E. Fail-safe

F. 24V powered

G. UL listed

H. Manufacturer:

1. Allegion LCN
    a. Sentronic SEM 7800 Series
    b. Coordinate finish options with Owner, Architect and Consultant.
    c. Provide appropriate mounting options as required.
    d. Provide with appropriate extensions as required.
        i. LCN SEM series, or equivalent, for short length extensions, stack as required.
        ii. Edwards 1500 series, or equivalent, for mid length extensions.
        iii. Utilize mag hold open extension chains for long extensions.
        iv. Floor mounting may be required when other options to not work.
2. Assa Abloy Rixon
3. Or approved equal

2.29 MASTER BADGE PRINTERS AND BADGING STATIONS

A. The Contractor shall provide a color badge printer and badging station at the following locations:

1. 1 station for this campus.

B. Provide a color badge station with the minimum following features:

1. Resin Thermal Transfer printing at 300 dpi,
2. Dual sided printing.
3. Single sided lamination.
4. 16.7 million colors and 256 shades per pixel
5. 75 cards per hour @ YMCKK with transfer and dual-sided printing
6. Accepts standard CR-80 card sizes
7. Accepts card thicknesses from 0.03” – 0.05”
8. 100 card capacity input card hopper
9. USB and Ethernet with internal print server
10. GSA FIPS-201 approved
11. 3.2” touch screen display

12. Three-year printer warranty and lifetime print head warranty.

C. The Contractor shall supply enough HDP film ribbons and other necessary supplies to be able to print 2,000 dual sided badges. Supplies shall be certified by HID Fargo.

D. The badge printer shall be an HID Fargo HDP5000 Photo ID System.

1. Or approved equal.

E. Provide with a HD USB camera and tripod for face capture.

1. 1080P video capture
2. Minimum of 8 megapixel still capture
3. Autofocus
4. Logitech or approved equal

F. Provide with backdrop and portable stand.

1. HID #086102 (stand)
2. HID #086100 (blue backdrop).
3. Or approved equal.

G. Provide a fully functional card reader and IP single door controller near the printer for card functionality and verification testing.

2.30 IP SIP SINGLE/DUAL/QUAD BUTTON INTERCOM WITH INTEGRATED IP CAMERA

A. Exterior rated with vandal proof housing.

B. 1, 2 or 4 illuminated programmable buttons capable of calling one, two or four different extensions.

C. NEMA 4X, IP 69 rated.

D. IK10 impact resistance rated.

E. PoE or 12 VDC powered.

F. (2) relays for device control and monitoring with tamper switch. The outputs shall be connected to the access control system headend for remote door unlock via DTMF where doors are required to be controlled. Furnish with relay expansion modules as required.

G. QoS support. The Contractor shall configure the unit for QoS and use a DSCP value of 46 for audio and 32 for streaming video.

H. Supports NTP time synchronization. The Contractor shall coordinate with the Owner to obtain the NTP IP address to configure the unit.

I. Contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.

J. Be equipped with an integrated event functionality, which can be triggered by: video motion detection, button press, DTMF, audio, schedule, camera tampering, embedded third party applications, external input, audio detection, edge storage disruption detection, ect. The

camera shall provide memory for pre & post alarm recordings. Event functions shall be configurable via the web interface.

K. IEEE 802.1X (Authentication) compliant.

L. Provide with appropriate surface mount backbox based on field conditions. Do not recess mount.

M. TR069 capable with cloud monitoring and provisioning service.

N. Provide an additional 18awg, 4-conductor cable from the access control headend to each intercom for door unlock integration.

O. Integrated Intercom specifications:

1. SIP VoIP compliant
2. Supports peer to peer mode.
3. Support multiple profiles for SIP mode and peer to peer mode. The Contractor shall set up a peer to peer profile for direct communication to a SIP enabled VoIP video phone intercom master station.
4. Capable of dialing up to 3 independent extensions for group or roll over.
5. 2-way, full duplex audio
6. AAC-LC audio encoding @ 16 kHz.
7. 94 db audio output over integrated speaker.
8. Built-in echo cancellation and noise reduction.

P. Integrated camera specifications:

1. Be designed to provide at least two simultaneous video streams in all resolutions, simultaneous including a SIP video stream, at a selectable range up to 30 frames per second (60Hz mode) using H.264 or MJPEG.
2. Support the following video resolutions: 160x90 to 640x480.
3. 135 degrees horizontal by 109 degrees vertical field of view.
4. Integrated LED for illumination.
5. ONVIF Profile S compliant.
6. Provide with (1) Video Management System license per intercom to record the integrated camera.

Q. Manufacturer and Model:

1. Hanwha TID-600R

2.31 CISCO IP PHONE 8865

A. The handset is a standard wideband-capable audio handset (connects through an RJ-9 port)

B. The 800 × 480, 24-bit color, 5-in. WVGA display provides scrollable access to calling features and text-based XML applications.

C. 720p HD video (encode and decode)

D. The standard coiled cord has a custom end for concealed cable routing beneath the phone (cord length is approximately 21 in. [55 cm] coiled and up to 72 in. (183 cm) extended)

E. The full-duplex speakerphone gives you flexibility in placing and receiving calls with hands free. For added security, the audible dual tone multifrequency (DTMF) tones are masked when the speakerphone mode is used.

F. Two USB ports enhance the usability of call handling by enabling wired or wireless headsets, in addition to providing charging capability to mobile devices such as smartphones or tablets. A side USB port provides up to 500mA power output at 5V or 2.5W. A back USB (in yellow) port provides 500mA power output and is upgradable to support up to 2.1A power output at 5V or 10.5W

G. The phone has a 3.5-mm stereo line in/out jack (for optional external headset, speakers, or headphones)

H. An internal 2-port Cisco Ethernet switch allows for a direct connection to a 10/100/1000BASE-T Ethernet network (IEEE 802.3i/802.3u/802.3ab) through an RJ-45 interface with single LAN connectivity for both the phone and a co-located PC

I. The system administrator can designate separate VLANs (IEEE 802.1Q) for the PC and phone, providing improved security and reliability of voice and data traffic.

J. The phone offers Bluetooth 4.1 LE, Enhanced Data Rate (EDR) Class 1 technology (up to 66-ft [20m] range)

K. As an alternative to wired Ethernet, the 8865 supports a Wi-Fi radio with integrated antenna enabling connectivity to a Wi-Fi access-point infrastructure, thereby saving on the labor costs of pulling Ethernet cables to every work location. Complete Wi-Fi specifications are included in Table 3 later in this document.

L. Manufacturer and Model:

1. Cisco IP Phone 8865

2. No substitutions without prior approval.

2.32 DOOR LOOPS (POWER TRANSFER LOOPS)

A. Provide new power transfer loops at the top of the doors for retrofit applications.

B. Provide all necessary materials and labor to connect existing electrified panic hardware and new access control system where appropriate.

C. Power transfer loop shall be armored stainless steel door loop with metal end caps.

D. Minimum interior diameter of 3/8” and exterior diameter of 1/2”.

E. Field verify the lengths required for each door.

F. Provide Locknetics DC Series.

2.33 SECURITY PEDESTAL

A. 11-awg or greater cold rolled steel, 4” minimum pipe size.

B. Single post dual neck design for standard vehicle height and truck height at vehicle entry points.

1. 42” high and 72” high hood locations with 8” necks.

C. Single neck design for pedestrian entry points.

1. 48” high with 10” neck.

D. Mount to a minimum of a 6” curb to reach a minimum of 48” for the lower neck.

E. All welded construction.

F. 12“x12” base with painted cover.

G. The pedestal shall be grounded. Furnish and install an 8’ x 5/8” ground rod as required.

H. Provide custom, painted, lockable hood large enough to accommodate long range readers, video intercoms, and other devices as required.

I. Manufacturer:

1. Chase Security Systems. Inc
    a. Single Neck Pedestal: 42-3-12-SS
    b. Dual Neck Pedestal: 72-9C-DSP-SS
    c. Card Reader and Intercom Hood: Lando-SS-14x10-E
    d. Card Reader Only Hood: MC-SS-10-E
    e. Card Reader Buffer Plate: 45PLA-PRO-001-HDP
2. Pedestal Pro
    a. Dual Pedestal 72-9C-DSP
    b. Single Pedestal 48-9C
    c. Card Reader Hood MC-CS-08-E
    d. Card Reader & Intercom Hood Lando-CS-12x8-E
3. Or approved equal.

PART 3 - EXECUTION

3.01 PHYSICAL SECURITY SYSTEMS AND INTERCOM INTEGRATION

A. The electronic access control system shall be integrated with the video surveillance system and intrusion detection system.

1. The access control/intrusion detection interface shall be via an Ethernet interface. Contact closure integration shall only be utilized if the system is existing and cannot be upgraded to Ethernet. The Contractor shall supply all necessary expansion boards if contact closure integration will be required.
2. The access control/video surveillance integration shall be via a native IP interface.
3. The video surveillance /intrusion detection interface shall be via an Ethernet interface.

B. The Contractor shall provide any and all licensing to integrate the systems together including any additional items to be added to the yearly maintenance agreement.

C. The following minimum features shall be included in the integration; the following list is not all inclusive or exhaustive. The integration shall be a turnkey solution:

1. Call up live and/or recorded video from an alarm or event.
2. Graphical maps showing camera icons.
3. “Mouse over” camera viewing through the DVR/NVR browser and graphical maps.
4. Playback controls for recorded video.
5. Camera names brought in from the VMS.
6. PTZ camera mouse control.
7. Database entries for intrusion arm/disarm events on individual keypads.
8. Database entries for intrusion alarm events.
9. Graphical map symbols for intrusion keypads tied to camera views.
10. Intrusion devices or zones tied to camera views.
11. Alarm pop-ups and events shall include instructions and a sequence of operation to deal with events on the Intrusion Detection System, Video Management System and Electronic Access Control System.
12. Intercom pop-ups when call button is pressed with the ability to unlock the door.
13. Time syncing via common NTP server.

D. The Contractor shall set up a meeting between the Owner, Consultant and manufacturer to determine the exact functionality of the integration before the integration starts.

3.02 SYSTEM PROGRAMMING

A. The Contractor shall provide all programming necessary for a turnkey system.

B. Programming shall include but not limited to setting all required IP addressing, setting passwords, firmware upgrades, adding the devices into the software, partitioning, area/zone creation, device naming, mapping, cross system integration, schedules, basic card holder groups, access levels, etc.

C. The Contractor shall be responsible for temporary schedules, card holder groups, access levels, etc required to make a building functional for certificate of occupancy requirements or basic facility use.

3.03 SYSTEM PARTITIONING, ZONING AND NAMING

A. The Contractor shall program each facility to be in its own partition. Some facilities may require sub-partitions to control user access to certain areas. Each manufacturer may use different names for partitions, zones, areas, etc. Adapt as required.

B. All devices, inputs, outputs and other applicable software/hardware entities shall be named by the Contractor which includes naming at the administration/interface level in additional to the user facing interface.

C. As a basis to start, the following partition, zoning and naming shall be followed:

1. Partition: Building name

a. Zone 1: Building name and zone name such as exterior, 1st floor, etc.
    i. Device 1: Building name and floor/zone name - Door # or device name
    ii. Device 2: Building name and floor/zone name - Door # or device name
    iii. Repeat as required
b. Zone 2: Building name and zone name such as 2nd floor, etc.
    i. Device 1: Building name and floor/zone name - Door # or device name
    ii. Device 2: Building name and floor/zone name - Door # or device name
    iii. Repeat as required
c. Repeat zones as required.

2. Repeat Partitions as required.

D. The Owner shall have the final say. The Contractor shall schedule a coordination meeting with the Owner and Consultant to coordinate actual project structure and naming prior to starting any programming.

3.04 INSTALLATION PROCEDURES

A. The Contractor shall cable all controlled or monitored doors, intercoms, etc. and terminate this cable in the access control panels no less than 3 weeks prior to substantial completion regardless of the status of the field devices such as door hardware, card readers, intercoms, etc.

B. The Contractor shall program the access control system no less than 2 weeks prior to substantial completion so when field devices are installed and terminated, associated door hardware and full system functionality can be tested. Programming shall include all doors, associated inputs, outputs, and interoperability regardless of final field device status.

C. The Contractor shall perform final connections and testing onsite when field devices such as electrified door hardware has been installed.

3.05 ADA POWER ASSIST DOOR OPERATOR INTERFACE

A. Certain electric locking mechanisms with card access shall be connected (hardwired) to the ADA Power Assist Door Operator pushbutton. In this scenario, card reader shall be interfaced to the ADA Door Operator pushbutton to approve activation of door motor based on card authorization or pre-programmed security schedule.

B. Door motor/operator shall not be energized until authorized by the security system to prevent operation and eventual burn-out of the motor from hitting the button with the security system activated.

C. The door shall allow free egress via push paddle regardless if the door is in a locked or unlocked state.

D. The paddles and operators shall be tied through the access control system, so the actions appear in the device trees, are mappable, logged and can be scheduled or overridden.

E. Contractor shall provide all necessary cable, hardware, relays, I/O modules, interfaces, and system programming to support all necessary functionality.

F. All logic and programming shall be controlled through the access control system. Local logic boards, smart relays, etc. shall not be utilized.

3.06 Door Release Buttons

A. Door release buttons shall be tied through the inputs of the access control system.

B. The button release shall be interfaced in a way that the actions appear in the device trees, are mappable, logged and can be scheduled or overridden.

C. Contractor shall provide all necessary cable, hardware, relays, I/O modules, interfaces, and system programming to support all necessary functionality.

3.07 INTERCOMS AND REMOTE INTERCOM RELEASE

A. The Contractor shall configure the intercoms and intercom master stations for point to point/multi-point communication with call rolling.

B. The Contractor shall update the Android interface on the Grandstreams phones with the provided file. Coordinate with the Consultant. All firmware shall be upgraded to a specific version for compatibility with the interface.

C. Speed dial shortcuts for all intercoms shall be added to the home screen on the Grandstreams.

D. Remote intercom release relays shall be tied through the inputs of the access control system.

E. The intercom release shall be interfaced in a way that the actions appear in the device trees, are mappable, logged and can be scheduled or overridden.

F. Contractor shall provide all necessary cable, hardware, relays, I/O modules, interfaces, and system programming to support all necessary functionality.

3.08 PANIC/DURESS BUTTONS

A. Panic/Duress buttons shall be tied through dedicated inputs of the access control system.

B. The buttons shall be interfaced in a way that the actions appear in the device trees, are mappable and logged.

C. When a panic/duress button is activated an event to action shall occur notifying client workstations. These alarms shall be activated on a map with a clear red flashing icon. Any associated or integrated cameras shall pop-up.

D. Additional actions may be required and shall be coordinated with the Owner and Consultant.

E. Contractor shall provide all necessary cable, hardware, relays, I/O modules, interfaces, and system programming to support all necessary functionality.

3.09 Key Switches

A. Key Switches shall be tied through the inputs of the access control system.

B. The key switches shall be interfaced in a way that the actions appear in the device trees, are mappable, logged and can be scheduled or overridden.

C. When the key switch is activated, the access control system shall electronically unlock the door or bank of doors and hold them unlocked until key switch is unlatched. When unlocked the LED should change from Green to Red signaling the door is unsecured.

D. While doors are electronically unlocked, ADA door operators shall function entering and exiting.

E. The software shall be able to override the key switch in the event of an emergency to relock the doors.

F. Contractor shall provide all necessary cable, hardware, relays, I/O modules, interfaces, and system programming to support all necessary functionality.

3.10 GATE/OVERHEAD DOOR CONTROL INTERFACE

A. The overhead door control interface shall be interfaced to the access control system via a standard Wiegand interface. Outputs for up, down and stop control shall be ran from the outputs of the access control boards.

B. The receiver shall be set in pass-through mode so the access control system makes the decisions.

C. The receiver shall be set in “advanced mode” and only accept the Owner’s transmitter facility code.

D. The Contractor shall connect the access control systems outputs to the overhead/bi-fold door motor for control.

E. The doors shall be capable of, one time pulse/override control via the software interface/maps and being held open on schedule.

F. The doors safety measures shall have priority control to prevent damage or injury.

3.11 FIRE ALARM INTERFACE

A. Certain electric locking mechanisms shall be connected (hardwired) to the building fire alarm system for fail safe release upon any fire alarm. A single low voltage/low current normally closed dry contact from the fire alarm system shall be provided by others in each room with Security Control Panels. This contact shall open on any fire alarm condition.

B. The access control system shall provide an output to the fire alarm system to release mag hold opens on alarm.

C. The fire alarm system shall provide an output to the access control system to trigger various rules and actions in the access control system.

D. All doors equipped with mag locks shall be connected to a fire alarm relay to release on fire alarm.

E. All doors secured with a card reader in and out shall be connected to a fire alarm relay to release on fire alarm.

F. The Contractor shall provide all additional UL listed failsafe relays and power supplies as necessary to interface to this contact and unlock all of these doors.

G. The Contractor shall verify fail safe and fail secure locking requirements with the Architect, door hardware contractor/provider and the AHJ.

3.12 MAGNETIC DOOR HOLD OPEN INTERFACE

A. Magnetic door hold opens identified to be controlled by the security system shall be interfaced to the access control system via I/O expansion modules.

B. These shall be capable of being controlled by schedule or by override in the event of an emergency.

C. Contractor shall provide all necessary cable, hardware, I/O modules, power supplies, interfaces, and system programming to support all necessary functionality.

3.13 EMERGENCY Alert Strobes

A. Emergency alert strobes shall activate upon the activation of a lockdown button, software action or other required method. The strobes shall continue to flash until the alarm is acknowledged and cleared.

B. The strobes shall all be in sync according to the NFPA and ADA standards.

C. Contractor shall provide all necessary cable, hardware, I/O modules, power supplies, interfaces, and system programming to support all necessary functionality.

3.14 END OF LINE SUPERVISION

A. The Contractor shall furnish and install end-of-line resistors to provide end-of-line supervision on all access control input devices. This shall include but is not limited to door position switches, request to exit devices, door release buttons, and duress/panic buttons.

B. The Contractor shall furnish and install resistors as near to the field device as possible. Supervision resistance values shall be natively compatible with the associated control panel.

1. Mercury Security based installations shall utilize 1K resistors to provide a 1K / 2K ohm resistance values from associated inputs.

3.15 RS-485 AND OSDP BASED COMMUNICATION

A. RS-485 based communication busses utilized by the access control system shall be compliant with the RS-485 communication standard, including RS-485 end-of-line termination requirements.

1. Repurposed reader communication cable shall adhere to RS-485 end-of-line termination requirements, but does not require compliance to RS-485 cable standards.

B. RS-485 communication busses include control panel and module communication, OSDP based reader communication, and RS-485 based intelligent lock gateways.

C. The Contractor shall furnish and install 120-ohm end of line termination at control panels, modules, readers, and other peripherals where applicable.

D. Termination shall be integral to the hardware where available. The Contractor shall furnish and install a 120-ohm resistor to terminate equipment not featuring on-board RS-485 termination.

E. The Contractor shall furnish and install 1K-ohm pull down/line bias resistors between the DAT/TR- and GND lines on interface modules and controllers. The pull down/line bias resistor shall be installed at the panel for each reader.

F. The Contractor shall configure OSDP devices to communicate at a minimum of 38,400 baud rate. The default 9,600 baud rate is not acceptable.

3.16 PASSWORDS

A. The Contractor shall coordinate a secure project password with the Owner and Consultant. This password shall be documented by the Contractor and used for all devices.

3.17 TESTING

A. Refer to Section 27 00 00 for additional requirements.

B. Prior to energizing or testing the system, ensure the following:

1. All products are installed in a proper and safe manner per the manufacturer's instructions.
2. Dust, debris, solder, splatter, etc., is removed.
3. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
4. All products are neat, clean, and unmarred, and parts are securely attached.

C. Contractor shall ensure that each device in the security system is functioning normally and in such a manner as to meet the functional and performance requirements in this specification.

D. All testing shall be documented utilizing the Pasadena ISD Functional Performance Test (FPT) documentation.

1. Obtain FPT documents directly from the Owner's Div. 28 inspector.
2. The contractor shall provide ten (10) day advance notification to owner for scheduling of the initial FPT to allow for document review for proper completion.
3. The contractor shall provide four (4) copies of record drawings and four (4) copies of completed FPT documents to the Owner before the FPT process is to start. Contractor documentation may be provided in electronic (PDF, XLS) format.
4. The contractor shall provide the project manager, a field supervisor, and a certified technician for adequate support during the FPT process.
5. The contractor shall staff the Owner's Monitoring Station to acknowledge alarms during the testing process.
6. A punch list will be developed by the contractor, and a copy provided to the Div. 28 inspector during the FPT. Following completion of punch list work, the contractor shall provide documentation to the owner demonstrating that punch list work has been completed and that the installation is at Final Completion.

E. Commissioning using FPT Testing consists of:

1. Valid credential.
2. Open door.
3. Closed door.
4. Propped door.
5. Force door.
6. REX.
7. Lockdown.
8. Latchbolt.
9. Video intercom door release.

F. Momentary Green valid card unlocked state. Solid Green in unlock schedule.

G. Contractor shall ensure that each device in the security system is functioning normally and in such a manner as to meet the functional and performance requirements in this specification.

3.18 TRAINING

A. Refer to Section 27 00 00 for additional requirements.

B. Provide system operations, administration, and maintenance training by factory-trained personnel qualified to instruct.

1. Contractor shall provide up to 6 hours of scheduled and dedicated training time in three (3) two (2) hour sessions for administration and investigation.

2. The Contractor shall provide up to 2 hours of dedicated training time for badge creation, printing and printer maintenance.

3. Provide printed training materials for each trainee, including product manuals, course outline, workbook or student guides, and written examinations for certification.

4. Provide hands-on training with operational equipment.

5. Training shall be oriented to the specific system being installed under this contract as designed and specified.

6. Contractor shall provide all necessary documentation of system operating parameters prior to scheduled training sessions.

3.19 WARRANTY

A. All manufacturer branded access control system components include a minimum two (2) year warranty commencing on the date of substantial completion. The two (2) year warranty warrants that the products will be free of defects and are functional in accordance with manufacturer's specifications. Any part that requires repair or replacement will be done so through the manufacturer's RMA process, and the manufacturer will choose the best option on a case by case basis. This warranty does not include labor or installation and only includes hardware supplied by the manufacturer.

B. B. The Contractor shall warrant the completed work for a period of two (2) years from the date of substantial completion to be free of defect in design, workmanship, or material.

C. Refer to Section 27 00 00 for additional requirements

3.20 Installation Practices

A. All services provided shall be professional and conform to the highest standards for industry practices. The Owner reserves the right to halt any installation due to poor workmanship. All work shall be defect free, and the installer shall replace, at their expense, any work found to be defective.

B. The Owner reserves the right to halt any installation due to failure of Contractor to observe installation-free periods due to instructional or administrative requirements. To the maximum extent possible, the Owner will provide advance notice of such periods.

C. Contractor is responsible for providing a complete and system.

D. All manufactured items, materials, and equipment shall be applied, installed, connected, erected, used, and adjusted as recommended by the manufacturers, or as indicated in their published literature, unless specifically noted herein to the contrary.

E. Contractor shall follow these standards and approved submittals for locations of power supplies. The Owner intends to limit the number and location of power supplies to facilitate more effective long-term support and maintenance of the system.

F. Installation of locks on fire rated doors which require any modification or drilling of the door shall be done in accordance with the NFPA by a properly qualified and certified installer. The doors field WH-ETL labelling shall be properly updated.

G. Contractor shall coordinate with the Electrical Contractor their requirements for conduits and proper AC power to service all equipment installed by Contractor in locations where power is not available.

H. Install (2) 2" conduits and junction boxes minimum from Access Control Panel (MDF room) or Expander cabinet (IDF room) into accessible ceiling space.

3.21 COORDINATION

A. Contractor shall provide up to 8 hours (up to four, 2-hour sessions) of scheduled and dedicated coordination time to assist Owner with sequence of operation, rule creation and coordination as requested by Owner or Consultant.

3.22 AESTHETICS

A. All cables and equipment terminating at panels frames shall be vertically straight, with no cables crossing each other, from twelve inches inside the ceiling area to the termination block.

B. All cable bundles shall be combed and bundled to accommodate individual termination block rows and panels.

C. For any given telecom room, a horizontal and vertical alignment for all mounting hardware will be maintained to provide a symmetrical and uniform appearance to the distribution frame.

D. All surface-mounted devices shall be firmly secured level and plumb

E. All rack mount equipment shall be securely installed.

3.23 HARDWARE LAYOUT

A. Hardware positioning and layout shall be reviewed and approved by the Owner prior to construction. The review does not exempt Contractor from meeting any of the requirements stated in this document.

3.24 SERVER INSTALLATION PRACTICES

A. Verify that the manufacturer approved server hardware, OS meets the Owner’s IT standards prior to ordering.

B. Coordinate server power, cooling, and mounting requirements with Owner prior to installation.

C. Coordinate virus scan/security software requirements with Owner and manufacturer prior to installation.

3.25 DEVICE CABLING/WIRING INSTALLATION PRACTICES

A. All external wire and cables shall be supported at least every five feet from the structure or as required to maintain not more than 12" cable sag between supports and without over

tensioning the cables. Provide j-hooks as needed where cable tray or raceway is not available.

B. This Contractor shall coordinate installation with Division 27 cabling Contractor to ensure there is at least 2-inches of physical separation between security cabling and voice/data cabling throughout cable path. Voice/data cabling Contractor has first claim to cable tray.

C. All cables, regardless of length, shall be labeled within 18" of both ends with an identifier that is keyed to the door, room, or corridor number as identified.

D. All cables shall have 6-foot service loops neatly coiled in the equipment room. During initial cable rough-in, this Contractor shall have sufficient slack to route anywhere within the equipment room.

E. Cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame. Cables shall be dressed in a neat and orderly fashion. Any cabling or equipment installation that is deemed unacceptable by the Owner or Consultant shall be replaced or corrected by the Contractor at no additional cost. Plastic zip ties are not allowed.

F. All cables are to run at right angles to the structure, placed above the ceiling in halls or corridors.

G. Cables shall not run above red iron joist.

H. Contractor shall make every effort to conceal wiring and other apparatus into walls, floors, and ceilings, assuming code and good engineering practice allows and suggests.

I. Ties and straps shall be installed snugly without deforming cable insulation. Ties shall be spaced at uneven intervals not to exceed four feet. No sharp burrs shall remain where excess length of the cable tie has been cut.

J. Contractor shall notify Owner immediately if obstruction or hazard is discovered in a pathway provided by others.

K. Cable shall be stored and handled to assure that it is not stretched, kinked, crushed, or abraded in any way. Bend radiuses shall meet manufacturer specifications and/or recommendations. Cable shall not be installed in ambient temperatures or moisture conditions above or below the manufacturer’s rating.

L. No splices shall be installed in any cable.

M. Provide minimum 6’service loop at Door Controller or junction box. These should be mounted on the secure side of the door and stubbed out into the hallway.

N. Wiring is to be performed as according to illustration to specify. Lockdown button to be wired normally open. LED is to be wired as Red.

O. IP addresses and naming standards are provided by the District. The list of controllers and IPs must be included in the ACS ordering so as the manufacturer will address the controllers prior to shipment.

3.26 CABLE TERMINATION

A. Termination hardware (blocks and patch panels) positioning and layout shall be reviewed and approved by the Owner prior to construction. The review does not exempt Contractor from meeting any of the requirements stated in this document.

B. All connections shall be made by gel filled B connector (Bean Type / Dolphin) only.

C. No jackets shall be allowed inside of the enclosure. Velcro only allowed. Cables shall be re-twisted after jacket separation to be kept neat, having abrupt 90 degree turns.

3.27 FIRE STOPPING

A. Fire stopping of openings between floors, fire-rated walls, and smoke-rated walls, created by others for This Contractor to pass cable through, shall be the responsibility of the This Contractor. Sealing material and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work.

B. Any openings created by or for This Contractor and left unused shall be sealed up by This Contractor.

C. This Contractor shall be responsible for creating a waterproof seal in and around any openings that This Contractor creates from the structure to the outside environment.

3.28 SYSTEM INSPECTION

A. Contractor shall coordinate with project representative for inspection after Contractor has completed testing of entire system.

B. Contractor shall have trained Contractor representative and testing equipment on site during inspection to assist with spot verification of tests.

3.29 LABELING

A. Contractor shall neatly label all security devices and cabling at both ends. All labels shall be on Project as-built drawings. When labels are applied to cabling, ensure that the label shall not unwrap itself when the cable has relaxed. All labels shall be black printed on white background. Character orientation shall be horizontal aligned with the cable length. No cable flags or die-cut flags are admissible. Labels shall be either heat shrink or polyester self-laminating.

3.30 DOCUMENTATION

A. Upon completion of the installation, Contractor shall provide full documentation sets to the Consultant for approval as described in section 27 60 00. All documentation shall become the property of the Owner.

B. Documentation shall include the additional specific items detailed in the subsections below:

1. Contractor shall provide hard copy and electronic forms of the final test results.

2. Contractor shall provide a document including the following:

a. Door label/identifier

b. Location of each drop by orientation/permanent landmark in the room

c. Contractor shall provide accurate as-built Construction Drawings. The drawings are to include cable routes and device locations.

3.31 PRE-CHECK OUT

A. The Contractor shall demonstrate the following to Owner during system demonstration.

1. The card readers are fully installed and functional.

3.32 FINAL ACCEPTANCE

A. In addition to closeout requirements in section 27 60 00, This Contractor shall demonstrate the following before final approval.

1. Owner training is complete.
2. Punch list items are complete.
3. As-built documentation is complete and submitted to Owner/Consultant.

3.33 FINAL PROCEDURES

A. Perform final procedures in accordance with section 27 60 00.

End of Section

SECTION 28 53 19

EMERGENCY RESPONDER DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes technical and performance requirements for an In-building Wireless System (IWS) based upon active amplification and Distributed Antenna System (DAS) architecture to support Public Safety Radio Enhancement / Emergency Responder (“Public Safety1, “First Responder”) Radio Coverage.

B. The Contractor shall provide all system design, project management, coordination with the Owner Entities. The contractor must ensure that the building envelope is sealed, including all windows and doors, in order to accurately determine whether the signal has passed or failed by using the proper signal tester.

C. The Contractor shall provide a turnkey Public Safety Radio Distributed Antenna System (DAS), including bidirectional amplifier, donor antenna, and distributed coverage antennas throughout the building to be in full compliance with both the International Fire Code (IFC) Section 510, National Fire Protection Association (NFPA) Section 1221, local Authority Having Jurisdiction (AHJ) requirements.

D. This scope shall include all pathways and penetrations necessary for installation, including provisions for a roof penetration and weather head to provide a pathway to the donor antenna on the roof. Where existing support can be provided the Owner will have final approval of acceptable use.

E. The Contractor shall coordinate required permits, submittals, and approvals of the AHJ.

F. This Contractor shall NOT be required to improve the existing Public Safety Communication System(s) outside of the building. Coverage within the building shall be contingent upon existing coverage levels at the exterior of the building.

1.02 REFERENCE

A. It is the Contractor’s responsibility to ensure that the DAS system equipment complies with all codes, ordinances, and requirements established by the local AHJ.

B. The equipment shall meet or exceed all current Electronics Industries Association (EIA) and Federal Communications Commission (FCC) standards and regulations applicable to the class of equipment proposed.

C. Installation practices shall meet all building Owner requirements.

1.03 CODES AND STANDARDS

A. In addition to requirements shown or specified, comply with applicable provisions of the following for design, materials, fabrication, and installation of component parts:

1. FCC Rules and Regulations (47 CFR) Report and Order 87 112

2. BICSI - Building Industry Consulting Service International, Inc. (RCDD Standards)

3. FCC Rules and Regulations 47 CFR Part 90.219

4. OSHA, Occupational Safety and Health Administration Recommendations

5. ANSI/TIA 603C, Land Mobile FM or PM -Communications Equipment -Measurement and

6. ANSI/TIA-222-G-1, Structural Standards for Steel Antenna Towers and Antenna Supporting

7. EIA/ECA-310E, Cabinets, Racks, Panels and Associated Equipment

8. TIA-329-C, Minimum Standards for Communication Antennas, Part 1: Base Station

9. ANSI/TIA-569 Telecommunications Pathways and Spaces

10. BOCA, Building Officials & Code Administrators, National Building Code

11. NFPA 78 Lightning Protection Code, National Fire Protection Association.

12. IBC, International Building Code

13. IFC Chapter 5 Section 510 Emergency Responder Radio Coverage, International Fire Code

14. NEC, National Electric Code.

15. ASTM, American Society for Testing Materials

16. NEMA, National Electrical Manufacturers Association

17. NESC, National Electrical Safety Code (ANSI C2)

18. MIL-STD, MIL-STD-810 Shock, Vibration and Environmental Standards

1.04 Abbreviations and Acronyms

A. The following abbreviations apply:

1. ACG: Automatic Gain Control

2. AHJ: Authority Having Jurisdiction

3. ATP: Acceptance Test Plan
4. BDA: Bi-Direction Amplifier
5. BOM: Bill-of-Material
6. BTS: Base Transceiver Station
7. CFR: Code of Federal Regulations
8. EBS: Educational Broadband Service
9. ESMR: Enhanced Specialized Mobile Radio
10. FCC: Federal Communications Commission
11. FHU: Fiber Head Unit
12. FRU: Fiber Remote Unit
13. IBC: International Building Code
14. IDF: Intermediate Distribution Frame
15. IFC: International Fire Code
16. MDF: Main Distribution Frame
17. MTBF: Mean Time Between Failure
18. NFPA: National Fire Protection Association
19. PIM: Passive Intermodulation
20. PSN: Public Safety Network
21. RSL: Received Signal Level
22. SNIR: Signal-to-Noise Interference Ratio
23. SOW: Statement of Work
24. UPS: Uninterruptable Power Supply

25. WSP: Wireless Service Provider

26. VSWR: Voltage Standing Wave Ratio

1.05 SYSTEM DESCRIPTION

A. The in-building wireless system, herein referred to as ~System', shall be a distributed antenna system. The System shall reliably distribute RF signals and wireless services throughout the specified frequency ranges and throughout the specified coverage spaces.

B. The System shall be implemented based on proven state-of-the-art technology that can seamlessly integrate with the rapid evolution of wireless technologies and business applications.

C. All active elements shall be located in telecom or equipment rooms to simplify maintenance and increase security. Locating active elements in or above ceilings is not acceptable. Locations for active equipment shall be approved by the Engineer.

D. Radiating coax or "leaky" coax systems are not acceptable.

1.06 SUBMITTALS

A. Preconstruction Submittal Requirements – Provide the following:

1. Technical data sheets for all equipment, including amplifiers, cabling, connectors, splitters, antennas, etc.

2. Evidence that the proposed solution is approved by the Authority Having Jurisdiction (AHJ) and meets or exceeds all local requirements prior to any work being done.

3. Certificate(s) from the manufacturers of the proposed system stating that the vendor has the necessary training and qualifications to install the equipment.

4. Specific detail(s)/shop drawings of any roof penetrations.

5. Detail drawings for the mounting and installation of donor antenna, distributed antennas, bidirectional amplifier, and all ancillary equipment.

6. Coordinate co-location and interconnection with fire alarm control panel (FACP), annunciator, and remote annunciator locations.

7. Electronic floor plan drawings indicating the locations of equipment and cabling pathways between them.

8. Schematic diagram showing the complete system connectivity. This must be specific to the project and installation, indicating operational details and locations of devices as depicted on floor plan drawings.

B. Close-out Submittals – Provide the following:

1. Submit the operation and maintenance manuals for any and all components of the DAS system in hard copy format in front & spline labeled three ring binders (two copies required), as well as in electronic PDF Format on USB jump drives.

2. Submit a record of Owner's equipment programming options setup.

3. Submit as-built drawings indicating a final, updated copy of all previously submitted documents reflecting the final, as-built representation, equipment used, and details.
   a. Include donor antenna, grounding and lightning protection details.
   b. Include cable routing, splitter, couplers, and coverage antenna final locations.
   c. Include active component locations, layout, configuration, and programmed parameters
4. Submit Test Reports:
   a. Submit sweep-testing results for all cable runs.
   b. Submit evidence of compliance with the requirements of the governing authorities and, where applicable, copies of Certificates of Inspection.
5. Submit Manufacturer's Equipment Warranty detail.
   a. Splitters, Couplers and Antennas:
   b. Coaxial Cable and Connectors:
   c. Active Components:
6. Contractor Warranty: Contractor shall warrant the system installation work as installed for 1-year from date of system acceptance.

1.07 CONTRACTOR QUALIFICATIONS:

A. The Contractor shall be a manufacturer authorized reseller of the proposed BDA devices.

B. The Contractor shall have a minimum of five (5) years of experience in In-Building Systems executing work of similar scope and complexity.

C. The Contractor shall provide a minimum of three (3) projects as references to similar size and scope.

D. The DAS designer and installation team shall hold license and the certifications as listed below.

1. Certification of in-building system training issued by a nationally recognized organization school.

2. A valid FCC-issued general radio operators license.

3. Certificate issued by the manufacturer of the equipment being installed.

1.08 PERFORMANCE REQUIREMENTS

A. In-building coverage improvements shall be provided that enhances the P25 RF communication system indoor coverage.

B. Coverage shall be acceptable when the above requirements are met and measured in 95% of all areas on each floor and 99% in critical areas as defined in NFPA 72.

1. Minimum signal strength receivable within the building is to be measured at no less than -95 dBm in acceptable locations.

2. Minimum signal strength receivable by the public safety radio system, when transmitted from within the building, is to be measured at no less than -95 dBm in acceptable locations.

C. On a per-channel basis, the Delivered Audio Quality (DAQ) of 3.0 with a 90% reliability factor for emergency personnel using radio communication in buildings and structures shall be guaranteed by Contractor.

D. DAQ test shall be performed as per the NFPA requirement in a grid pattern. On a per-channel basis, the downlink and uplink RSL for each frequency shall meet or exceed the criteria.

E. Prior to installation, the Contractor shall confirm the channel count, loading, and frequencies used in the service area and shall guarantee coverage for these channels per the criteria.

F. The DAS shall be capable of modifications and upgrades, without the need to replace the proposed hardware or software, to allow for changes and additions to system frequencies within the deployed frequency band in order to maintain radio system coverage as originally designed.

G. The DAS shall provide alarming capabilities and be integrated into building alarm systems.

H. The DAS shall have network access to allow remote monitoring and access.

I. The DAS system shall be equipped to provide independent power backup unit sized to handle the system operation at full capacity for a minimum of twelve (12) hours.

J. The Contractor shall explain the method used to avoid downlink and uplink interference.

PART 2 – MATERIAL

2.01 MANUFACTURERS

A. Contractor shall propose all equipment in a complete system solution, and all equipment shall meet or exceed requirement of IFC, NFPA, and local AHJ standards.

B. Components utilized in the installation of the public safety radio enhancement system, such as repeaters, transmitters, receivers, signal boosters, cabling, and fiber-distributed antenna systems, shall be approved and shall be compatible with the public safety radio system.

C. All system equipment shall provide a minimum full coverage warranty period of 1 year from the date of acceptance.

2.02 COMPONENTS

A. Bi-Directional Amplifier (BDA):

1. Characteristics:

a. Gain: 45-90 dB as required by the design, with the ability to provide programmable attenuation at lower values
b. Channelized 700/800 MHz operation
c. Capable of battery backup operation
d. Dry Contact Alarming
e. Maximum Output Power: + 32 dBm
f. Maximum Noise Figure: 8 dB
g. Minimum -50 dB 3rd order intermodulation rejection
h. Operating Temperature Range: -20 °C to +50 °C
i. Mounting Options: Shall be capable of wall mounting in a NEMA Type 4 or 4X enclosure as required by the design.
j. FCC: Shall be FCC type certified.

B. Door Antennas:
1. Electrical:
a. VSWR ≤ 1.5:1
b. Maximum input power: 100 watts
c. Front-to-back ratio: ≥ 15 dB
d. Polarization: Vertical
e. Impedance: 50 Ω
f. Azimuth Pattern: As proposed by the manufacturer to meet the performance specifications

1. Mechanical:
a. Connector: 50 Ω N Type
b. Mounting: Pole or wall

2. Environmental:
a. Lighting protection: Direct ground or manufacturer provided
b. Minimum wind rating (w/o ice): 100 mph

C. Distributed Antennas
1. Electrical:
a. Frequency Bands Supported: 698 - 2700 MHz
b. VSWR: ≤ 2.1:1
c. Impedance: 50 Ω
d. Beamwidth, Horizontal: 360° omnidirectional
e. Polarization: Vertical

f. PIM rated

2. Mechanical:

a. Mounting: Through-hole ceiling mount
b. Pigtail cable: Plenum rated

3. Environmental:

a. Operating Temperature: 40°F to 140°F
b. Relative Humidity: Up to 100%

D. Cabling Systems

1. Air Dielectric, Plenum Rated Cable:

a. Material Characteristics:
i. Jacket: Halogenated, Fire-Retardant, Plenum rated Outer Conductor
ii. Material: Corrugated Aluminum or Corrugated Copper Inner
iii. Conductor Material: Copper-Clad Aluminum Wire

b. Electrical Characteristics:
i. Impedance: 50 ± 2.0 Ω
ii. Frequency Bands Supported: 698-2700 MHz

c. Mechanical Characteristics:
i. Diameter Over Jacket: ≤ .627 in
ii. Minimum Bending Radius: ≤ 5 in

2. Foam Dielectric Cable:

a. Material Characteristics:
i. Jacket: Non-halogenated, Fire-Retardant Polyolefin
ii. Outer Conductor Material: Corrugated Copper
iii. Inner Conductor Material: Copper-Clad Aluminum Wire or Copper Tube

b. Electrical Characteristics:
i. Impedance: 50 ± 1.0 Ω
ii. Frequency Band: 1/2” Nominal: 698-2700 MHz

c. Mechanical Characteristics:
i. Diameter Over Jacket: 1/2” Nominal: ≤ .630 in, 7/8” Nominal: ≤ 1.1 in

ii. Minimum Bending Radius: 1/2” Nominal: ≤ 5 in, 7/8” Nominal: ≤ 10 in

iii. One Time Minimum Bending Radius: 1/2” Nominal: ≤ 2 in, 7/8” Nominal: ≤ 5 in

3. Ancillary Components

a. Splitters, combiners, couplers, taps, connectors, jumpers

2.03 SECONDARY POWER

A. The system shall be provided with an approved secondary source of power. This secondary power supply shall be capable of operating the system for a period of at least 12 hours. When primary power is lost, the power supply to this system shall automatically transfer to the secondary power supply.

2.04 SYSTEM MONITORING

A. Active devices shall provide monitoring outputs to the Fire Alarm System that trigger a signal in the event of any issue that would inhibit the system from meeting the operational requirements, including the following scenarios:

1. Loss of primary power

2. Donor antenna malfunction

3. Distributed antenna malfunctions

4. Signal failure

PART 3 – EXECUTION

3.01 PRE-INSTALLATION

A. Contractor, prior to beginning the on-site installation, is required to submit, for approval by the Owner, the following information:

1. Shop Drawings: After receiving acceptance from the Owner and/or authorized representative for the materials and equipment list, and before ordering, purchasing, fabricating, or installing any materials or equipment, the Contractor shall submit schematic design drawings of the systems to demonstrate compliance with the construction documents.

2. Functional system block diagrams showing single line interconnection of all integrated systems and the major components of each system and methods of integration.

3. System theory of operations that clearly defines the operating parameters of all systems being supplied.

4. Acceptance Test Plan (ATP) shall be submitted to and approved by the Owner. The ATP shall include Isolation Testing for all BDAs.

5. Detailed Statement of Work that includes a project schedule.

6. Evidence that the proposed solution is approved by the Authority Having Jurisdiction (AHJ) and meets or exceeds all local requirements.

3.02 COORDINATION

A. Contractor shall field coordinate the installation of all DAS equipment with other trades – particularly the Electrical Contractor and Structured Cabling Contractor – to ensure that each device location is provided with the necessary infrastructure.

B. Contractor shall coordinate installation work with Owner.

3.03 INSTALLATION

A. The Contractor shall be responsible for following all manufacturer's instructions and recommendations with respect to the system design, installation, commissioning, and testing.

B. Installation shall include the delivery, unloading, setting in place, fastening to walls, floors, ceiling, or other structures and where required, penetration fire-stop, interconnecting wiring of the system components, equipment alignment, and adjustments, and all other work whether or not expressly required herein which is necessary to result in complete operational DAS.

C. All installation practices shall be in accordance with, but not limited to, these specifications. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of National, State, and Local Authorities having jurisdiction. All distributed antenna cables shall be installed such that the cables are as straight as possible.

D. During the installation and up to the date of final acceptance, the Contractor shall be under obligation to protect his finished and unfinished work against damage and loss. In the event of such damage or loss, he shall replace or repair such work at no cost to the Owner.

E. All cabling shall be concealed from view with the exception of cabling running in communication closets (IDF and MDF spaces), and/or Mechanical and/or Electrical rooms or mezzanines.

F. Cables shall be properly supported with dedicated hangers or brackets.

G. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three.

H. All cable supports system shall be secured to the building structure rigidly with threaded rods and beam clamps, and/or cables shall be secured and supported independently at both ends above suspended ceiling per NEC requirements.

I. All boxes, equipment, etc., shall be secured plumb, level, and square.

J. In the installation of equipment and cable, consideration shall be given to operational efficiency and overall aesthetic factors. Antennas shall be centered and in-line with other ceiling mounted devices.

K. All cables the Contractor installs shall be handled in accordance with the manufacturer's guidelines. Transmission line cables have minimum bending radius specifications that shall be followed. In the event a cable is kinked or bent excessively during installation, that section

of cable cannot be used, even if subsequently straightened. The damaged area of the cable shall be removed, and a new section installed using correct splice methods. Ultimately, the cable shall pass the testing and meet the manufacturers requirements.

L. Radio communications cabling shall not be grouped with electrical cabling.

M. Radio Communications cabling must have its own pathways and cannot use the cable tray or any of the technology pathways.

N. All conduit penetrations shall comply with all applicable fire codes. Contractors shall seal and fire proofed any cable penetrations they may use or make where the conduit penetrations is in fire-rated walls, smoked/acoustic walls and floors.

O. Completely seal around the conduit penetration with Hilti FS 601 fire-rated sealant or equivalent by Tremco, 3M or equal.

P. Connection between cables and other antenna components shall use 4.3-Type premium connectors. No splicing is permitted.

Q. All power dividers shall be securely mounted in place either by bolting the mount to a solid surface or securing each by suspension on the cables within 4 inches of each connector termination at the power divider. The transmission lines connecting to the device shall be routed in the shortest possible path.

3.04 GROUNDING

A. In order to minimize problems resulting from improper grounding and to achieve maximum signal-to-noise ratios, the following grounding procedures shall be adhered to:

1. System ground: a single primary “system ground” shall be established for the system. All grounding conductors in that area shall connect to this primary system ground. The system ground shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors.

2. A copper conductor, having a maximum of 0.1 ohms total resistance, shall connect the primary system ground bar to the primary system active components.

3. Under no conditions shall the neutral conductor, either in the power panel or in receptacle outlets, be used for a DAS component ground.

B. Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow good engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios and reduce interference in the radio systems.

3.05 INTERFERENCE ANALYSIS

A. No amplification system capable of operating on frequencies or causing interference on frequencies assigned to the jurisdiction by the FCC shall be installed without prior coordination and approval of the authority having jurisdiction. The building manager/owner shall suspend and correct other equipment installations that degrade the performance of the public safety radio system or public safety radio enhancement system.

B. The Contractor shall cooperate to resolve reports of interference to or from collocated equipment where the following criteria are met:

1. The interference shall be reported within one year following final system acceptance.

2. The collocated equipment shall have been licensed, installed, and operational prior to the start of on-site installation.

3. The collocated equipment shall be operating within the bounds of its license, FCC regulations, and published equipment specifications.

C. The Contractor shall resolve any interference that meets the above criteria at no cost to the Owner. This may require furnishing and installing additional filtering or other equipment but is not intended to include research and development of new equipment.

D. Isolation testing shall be performed to ensure the DAS does not interfere with the PSN network. Isolation shall be maintained between the donor antenna and all inside antennas and shall be a minimum of 15 dB above the signal booster gain under all operating conditions.

3.06 ACCEPTANCE TESTING

A. Acceptance testing shall be performed conforming to the requirements of this Section by a Certified Technician.

B. Testing shall meet all requirements in IFC 510, NFPA 72, and other applicable codes.

C. Contractor shall complete the acceptance testing as prescribed in the approved Acceptance Test Plan (ATP) submittal. Testing shall be witnessed by the AHJ or their representative.

D. Prior to start of testing, provide a list to Consultant of test equipment make, model numbers, and calibration dates that will be used.

E. Interference performance is the measure of the effects of the DAS on other co-located equipment, and of other equipment on the DAS. The Contractor shall complete interference performance testing to verify the DAS does not interfere with the co-located equipment and the co-located equipment does not interfere with the DAS.

F. Each floor of the building shall be divided into a grid of approximately twenty (20) equal areas. Each area shall be tested for two-way audio communications and RSSI. An area shall be considered to have failed if DAQ in one or more directions (talk-in or talk-out) is below 3.0 or if the RSSI is below -95 dBm. A maximum of two (2) nonadjacent areas shall be permitted to fail the test on each floor. In the event that three (3) of the areas fail the test, and to provide greater statistical accuracy, the floor may be divided into forty (40) equal areas. In such an event, a maximum of four (4) nonadjacent areas shall be permitted to fail the test.

G. Transmissions originating from the DAS shall be received by the PSN with a minimum Receive Signal Strength of -95 dBm.

H. Contractor may be required to coordinate this testing with entities other than the AHJ.

3.07 TRAINING

A. Contractor is required to provide comprehensive training covering system design and equipment operations in a single process.

1. Equipment operations and failure indications shall be provided to the Owner.

2. Alarm logging systems operational training shall be provided to the Owner.

3. Equipment layout and location detail shall be reviewed with the Owner.

B. Training shall be coordinated with Owner's schedule, and Contractor personnel who provide training are subject to Owner's approval.

3.08 PROJECT ACCEPTANCE

A. System shall be considered complete when all of the following has occurred:

1. Testing has been completed to the satisfaction of Owner and Consultant.

2. Punch-listed items have been addressed to the satisfaction of Owner.

3. As-built drawings and system documentation has been turned over to Owner and Consultant.

4. Complete operational training has been conducted with Owner's staff.

5. System Commissioning Process has been completed.

6. The AHJ has tested the signal strength throughout the building and provided a Certificate of Approval.

B. Upon completion the Contractor shall secure written Acceptance of systems in the form of authorized Owner signature on Acceptance Document. This shall constitute the date of Acceptance.

End of Section

SECTION 28 31 00
FIRE DETECTION AND ALARM SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.02 SCOPE

A. Provide a complete new Voice Evacuation Fire Alarm system to the most recent issue of the applicable NFPA 72 fire alarm code sections, the National Electric Code, applicable local codes.

B. Fire alarm subcontractor shall provide fire alarm design and drawings to submit to city fire department for approval and permit.

1.03 SUBMITTALS

A. The installing contractor and/or equipment supplier shall provide complete and detailed shop drawings and include:

1. Riser diagrams.
2. Complete floor plan drawings locating all system devices.
3. Factory data sheets on each piece of equipment proposed.
4. Detailed system operational description. Any specification differences and deviations shall be clearly noted and marked.
5. Complete system bill of material.
6. Line by line specification review stating compliance or deviation.
7. Operational narrative of each component/system.
8. Qualification Data: Letters of certification for each supplier.

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 – SYSTEMS

2.01 GENERAL

A. Design, furnish and install a complete Voice Evacuation Fire Alarm system based on a fire alarm panel utilizing addressable architecture with analog intelligent devices as specified herein. Installation shall be in accordance with the manufacturer's recommendations. The system shall

conform to the most recent issue of the applicable NFPA Sections, the National Electric Code and applicable local codes for fire detection/alarm requirements. This also includes the State of Texas requirements for school facilities. Note that the fire alarm contractor shall design a complete fire alarm system including drawings to submit to the Fire Marshall for permit and approval. No Project Drawings will be provided. This project Specification is provided for for bidding purpose.

B. Manufacturer:

1. EST - Edwards.

a. Note: Other fire alarm supplier with equal system can submit prior approval package during bidding period (minimum 10 business day before the bid day) for review and approval. No alternate suppliers' fire alarm submittal will be allowed after the bid day. No exception.

C. CONTRACTOR QUALIFICATIONS (GC is responsible to verify the qualifications of fire alarm contractor)

1. The installing contractor shall be the authorized representative of the Fire Alarm Manufacturer to sell, install, and service the proposed manufacturer's equipment. The installing contractor shall have represented the fire alarm manufacturer's product for at least five years.

2. Installer Qualification: Installer must have minimum 10-year experience for school fire alarm projects.

3. Installer must complete installation and programming training programs from manufacturer. Submit IPA Training Certificate from manufacture.

4. The installing contractor shall be licensed by the State Fire Marshall to sell, install, and service fire alarm systems as required by Article 5.43-2 of the Texas Insurance Code.

5. The installing contractor shall have on his staff an installation technician 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 Texas Insurance Code. The RAS Fire Licensed (or Higher) fire alarm technicians to supervise the programming and testing of the system to ensure the systems integrity.

6. The installing contractor or equipment supplier shall have on staff a minimum of two (2) certified NICET Level III state licensed fire alarm planning superintendents under whose supervision system design shall take place. In lieu of an alarm planning superintendent, the contractor may provide design supervision by a registered professional engineer.

7. The installing contractor shall provide 24 hour, 365 days per year emergency service with factory trained, state licensed service technicians.

8. The installing contractor shall have been actively engaged in the business of selling, installing, and servicing fire alarm systems in the surrounding area for at least ten (10) years.

D. The system shall include but not limited to fire alarm panels, manual pull stations, automatic smoke/heat detectors, duct smoke detectors with remote indicator light, auxiliary control devices, relays, visual and audible speaker alarm devices, annunciator, TCP/IP (Ethernet) and/or digital alarm communications to central stations, microphone and accessory equipment as described in the specifications and/or indicated on the drawings. All components of the system shall be standard products of the manufacturer, approved by Factory Mutual and Underwriters' Laboratories, Inc.

E. The system shall have a minimum of two or more SLC loops and wired to allow expansion of each loop. Each SLC loop shall have 50% spare capacity. The system shall be wired as a Class B, supervised for the network communication loop; Class B, supervised for all SLC circuits, and Class B supervised for communications circuits initiating and notification circuits.

F. Provide devices in sufficient number and locate to protect and alarm the specified areas in accordance with the NFPA, these specifications and the limitations of the devices provided.

G. After installation and prior to the final inspection, the Contractor must certify in a letter to the Owner that the system is working in accordance with the Contract Documents.

H. Provide an adequate period of instruction on the operation of the system to the Owner's designated personnel upon completion of the system installation.

I. Provide the Owner with the following:

1. Two composite wiring diagrams of the system indicating point to point connections, one to be placed in the control panel.

2. Two block diagrams of the system indicating conduit and number and size of wires between all devices, one to be placed in the control panel.

3. Three complete instructional/operational maintenance manuals, one to be placed in the control panel.

4. Floor plan of building noting zoning, pull station and detector locations, acceptable to the Fire Marshall. Provide frame and install where directed by the Fire Marshall.

J. Contractor shall have a representative at the job site during the final inspection by the Engineer to demonstrate system operation and specification compliance. Representative will be required to "smoke test" a number of randomly selected active devices.

K. System warranty shall be for one year of complete maintenance coverage after final acceptance of the system and include all material and labor to provide consistent peak performance of the system. Post-warranty maintenance shall be available on contract or call basis.

2.02 SYSTEM LAYOUT

A. Contractor shall provide fire alarm Drawings shows areas of coverage and to assist the electrical contractor in estimating junction box requirements during bidding. Fire alarm supplier shall properly design a system based on his equipment and devices that meets ADA, NFPA and Texas Accessibility requirements and these specifications. Contractor shall provide drawings of his system design for review and approval by the local fire marshal.

B. Provide fire alarm panel with Voice Evacuation System and microphone in MDF room. Provide remote annunciator at front office. Provide Ethernet/I.P. Connection.

C. Provide fire alarm voice speaker and visual alarm coverage of the building.

D. Provide exterior weatherproof fire alarm voice speaker at the front of the building and at the court yards.

E. Provide a manual pull station with stopper II cover on wall at each exit from the building. Provide a manual pull station at fire alarm panel and at remote annunciator.

F. Provide smoke detector coverage of all halls and corridors, storages, workroom, locker room, Daycare area, Central Mechanical/Electrical/MDF/IDF/Clinic Room and each AHU Room.

G. Provide smoke duct detector in the supply air of each air handling unit. Provide smoke duct detector in all HVAC units reguardless of CFM. Where AHU is above roof, provide remote indicator light below ceiling.

H. Provide relays to turn off all air conditioning supply units in the event of a fire.

I. Interlock alarm with Kitchen hood fire suppression system.

J. Interlock alarm with fire sprinkler system and monitor position of O S & Y valves and Post Indicator Valve. Provide individual address for each valve sensor and flow switch.

K. Protect heat detector coverage of all lounge, kitchen, janitor, labs, water heater room, etc.

L. Provide a heat detector adjacent to each fire sprinkler head located in the elevator equipment room and elevator shaft. Heat detector shall be coordinated with sprinkler head sensor such that the heat detector will alarm first. Upon alarm, elevator shall be signaled to return to the first floor, then elevator power shunt trip circuit breakers shall be tripped. Activation of other detectors associated with elevator equipment shall cause elevator recall, alternate recall, or cab signal as required by NFPA 72 and ANSI A-17.

M. Provide surge protection devices for fire alarm panel, remote power supply panel, both indoor and outdoor fire alarm initiating circuits, fire alarm notification circuits, 120V power and telephone / data lines.

N. System shall have provisions for eight temporary buildings. Provide capacity for 40 addressable devices on a separate dedicated loop extended to the edge of the building near the future temporary buildings (see drawings). Provide two dedicated NAC circuits in 1900 block. Provide 16 spare smoke detectors, 16 spare pull stations, 16 spare visuals and 8 spare exterior type horns for future installation in the temporary building by Owner. Provide dedicated separate expansion card in fire alarm panel prepared for temporary buildings.

O. Monitor the power supply of the Rescue Assistance Control Panel.

P. Monitor Emergency Radio Communication Enhancement Systems with fire alarm system.

Q. Provide fire alarm module at the sound system racks to shut down audio for sound system. Typical for all location sound system such as Auditorium, Cafeteria and Gym, etc.

R. Refer to NFPA 72, local codes and fire department for additional requirements.

S. Refer to Drawings for additional information.

2.03 SYSTEM OPERATION

A. Actuation of any alarm initiating device shall cause the following:

1. An LCD readout on the main control panel shall indicate the device in alarm.

2. All speaker/flasher alarms shall sound recorded fire alarm message continuously until silenced at main panel.

3. De-energize air handling units serving the area in alarm. Also, de-energize supply fans, VAV boxes and other air circulating devices if 2000 CFM or over, serving the area in alarm. Exhaust fans to the exterior and devices less than 2000 CFM are excepted.

4. Interface with the elevator.

5. Close all smoke control dampers. Provide control relay within three (3) feet of each smoke damper or power supply.

6. Transmit alarm warning to remote location via telephone line.

7. Interface with Commercial Cooking fire suppression systems.

8. Operation of any sprinkler system water flow switch shall activate the sprinkler alarm belt.

B. The actuation of automatic detection devices shall be visually identified by light on device. The light shall remain illuminated until the initiating device has been restored to normal and the Fire Alarm Panel reset. A remote alarm lamp shall light where indicated on drawings.

2.04 SHOP DRAWINGS

A. Provide shop drawings as described in Section 26 00 00 1.13 to include equipment brochures and building drawing indicated devices and equipment locations.

B. The installing contractor and/or equipment manufacturer shall provide complete and detailed shop drawings and include:

1. Manufacturer’s control panel configuration including wiring and interconnection schematics.

2. Complete point to point wiring diagram showing terminal connections to all system devices.

3. Riser wiring diagram and associated zoning/addressing configurations with associated conduit sizes.

4. Complete floor plan drawings locating all devices associated with the fire alarm system. Floor plan drawings shall include conduit and wiring routing complete with conduit sizing

and number of conductors by type. Floor plans shall be in the latest version of AutoCAD.

5. Factory data sheets on each piece of equipment to be used and so marked as to model, dimensions, size, voltage, and configuration.

6. Detailed system description in this specification format describing system functions and operation. All specification variations and deviations shall be clearly noted and marked.

7. Complete Bill of Material for reference.

8. Programming matrix defining all input/output functions and zoning.

9. Power supply and battery calculations.

10. Written certification from the manufacturer stating that the distributor is authorized to sell, service and install the proposed fire alarm system.

11. Submittal shall include documentation confirming all qualifications in 2.1 C have been met. Submittals without qualification documentation shall be rejected.

C. All submittal data will be in bound form with contractor's name, supplier's name, project name, and state fire alarm license number adequately identified.

D. Only basic equipment devices have been shown on the contract drawings. Specific wiring between equipment/devices has not been shown. It is the contractors' responsibility to submit for approval the COMPLETE ENGINEERED system configuration and layout showing all devices, wiring, conduit, and locations along with other required information as specified herein.

2.05 EQUIPMENT

A. GENERAL: All equipment shall be manufactured by the same company as the control panel or be a factory authorized compatible device. Devices that may operate but are not factory authorized compatible shall not be used. This includes remote power supplies, speakers and strobes. The Fire Alarm Control Panel and associated field devices shall be manufactured or supplied 100% by a single U.S. manufacturer that is ISO 9001 certified.

B. CONTROL PANEL: The fire alarm system control panel is an Fire Detection with separate Voice Evacuation System subpanel with microphone. It is an addressable intelligent system enclosed in a surface mount style cabinet. The door and frame assembly shall be equipped with a lock and transparent door panel for viewing of indicators of operation and annunciation. The control panel shall contain, but not limited to the following:

1. Control panel to be unit model iO-1000 only.

2. Separate voice control subpanel to be ANS series only.

3. Control modules as required to provide system monitoring, alarm control, trouble sensing and remote equipment control.

4. City/remote station module to service as interface unit between the fire alarm control panel and an authorized remote monitoring point.

5. Provide communication panel to call two phone number.

6. Provide Ethernet/I.P. Connection and cell phone network connection.

7. Power supply modules as required to supply continuous filtered power of the proper voltage. Module shall indicate a normal power, battery trouble and power supply trouble, all readable on front of the enclosure. Power supply shall be sized 50% larger than necessary for the installed system.

8. In addition to Generator powered emergency circuit. Contractor shall provide sealed and rechargeable battery supply, sized for 24 hour sensing and 5 minute alarm capability, based on system installed plus 50% additional alarm devices.

9. Remote alarm signal distributing panels with power supplies as needed by final design of the fire alarm contractor.

10. Provide a fire drill switch located on the Fire Alarm Control Panel.

11. Provide local remote annunciator in administration area.

12. Provide Mode Emergency and General Utility Signaling.

13. Monitoring modules to monitor Emergency Radio Communication Enhancement Systems with fire alarm system.

14. Provide remote microphone and microphone cabinet at administration area.

15. Provide fire alarm module at the sound system racks to shut down audio for sound system. Typical for all location sound system such as Auditorium, Cafeteria and Gym, etc.

C. DIGITAL COMMUNICATOR: Two channel dialer/modem to automatically call two different designated numbers in the event of a fire or system trouble. Also, Provide Ethernet/I.P. Connection. Contractor shall provide two phone drops, one network data drops and three Cat 6 phone/data cables from MDF. Owner provides NFPA 71 central station connection and maintains that service. Cellular telephone dialer and IP communicator.

D. MANUAL PULL STATIONS: Addressable type, red lexan, non-coded, dual action type. Provide Stopper II cover with battery powered sounder over all pull stations except where noted on the Drawings.

E. AREA SMOKE DETECTORS: Analog addressable, photoelectric type, non-polarized with 360° smoke entry, LED normal/alarm status light and separable base.

F. DUCT DETECTORS: Analog addressable, photoelectric type with DPST auxiliary relay. Provide LED remote alarm light with engraved stainless steel plate on ceiling near detector where detectors are not located in mechanical rooms.

G. HEAT DETECTORS: Analog addressable, rate of rise type.

H. SPEAKER STROBES: Semi-flush, ADA compatible, electronic speaker with high visibility, synchronized strobe and field selectable sound level. Set level based on individual application

(hall, classroom, restroom, office, etc.) Fire alarm message must be loud and clear as required by NFPA 72. Strobe intensity shall conform to NFPA NFPA 72 Chapter 7 requirements and also 75 candela to meet ADA and TAS requirements.

I. STROBE LIGHTS: Semi-flush, ADA compatible, synchronized strobe with intensity suitable for the individual application (hall, classroom, restroom, office, etc.). Strobe intensity shall conform to NFPA NFPA 72 Chapter 7 requirements and also 75 candela to meet ADA and TAS requirements.

J. RELAYS: Provide and install addressable control/monitor control relays to perform the specified functions. This includes relays to shutdown the various HVAC equipment and water flow indicators for fire protective signaling systems. Relays shall be mounted near items to be controlled. Coordinate with HVAC controls contractor for relay contact voltage capability (120 volts minimum) and preferred mounting location.

K. CO DETECTORS: Provide Carbon Monoxide detectors as shown on the plan. CO detector trouble and alarm signal shall be shown on fire alarm panel with separate light and notification message dedicated for CO detectors. Provide CO detectors in boiler rooms, gas water rooms, mechanical room, space with natural gas heater, kitchen, clinic cots, and any other rooms with natural gas appliance and equipment.

L. DOCUMENTATION CABINET: Provide document cabinet with engraved nameplate reading “Fire Alarm System Documentation Cabinet”. Provide a copy of the following information in side documentation cabinet:

1. Written Narrative
2. Riser Diagram
3. Floor Plan
4. Sequence of Operation
5. Equipment Technical Data Sheets
6. Manufacturers Published Instructions
7. Battery Calculation
8. Voltage Drop Calculation
9. Completed Record of Inspection & Testing
10. Completed Record of Completion
11. A copy site specific software and programming for fire alarm control panel.
12. Record (As-Built) Drawings.

M. WEATHERPROOF: Devices located outside, even if sheltered from rain shall be weatherproof and suitable for outdoor installation.

N. GUARDS: Provide wire or lexan guards over detectors, horns, strobe lights or other devices in gyms, weight room, locker rooms and outdoor.

O. SURGE PROTECTION DEVICES: Provide surge protection devices for fire alarm control panels, remote power supplies, indoor and outdoor fire alarm data and signal circuits and telephone circuits.

P. Printer: Provide printer and printer stand connected to fire alarm panel in MDF room.

Q. SPARES: Provide three additional area smoke detectors, manual pull stations, speaker/strobes, strobes, and control modules/relays including installation, raceway and wiring where directed during construction. Items not installed shall become spares and be delivered to the Owner. Contractor shall include conduits and Junction Boxes in base proposal.

2.06 INSTALLATION

A. WIRING:

1. Fire alarm contractor shall provide and install all wiring for his system. He shall include wiring of control relays and the landing of power and control wiring to these relays to “break” control circuits or power wiring to controls transformers, door release magnets and other devices requiring shutdown. HVAC controls interlock wiring between fire alarm relay and starters, VFD’s or other temperature controls devices shall be provided by the temperature controls contractor.

2. All wiring shall be in accordance with NFPA 72 and 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.

3. All wiring for SLC signaling circuits shall be of the twisted/shielded, low capacitance type to guard against outside RF and EMF interference and induced noise.

4. Provide CTC 2-hour fire rated cable for all risers.

5. All wiring shall be run in a supervised fashion (i.e. no branch wiring or dog-legged wiring) per NFPA requirements such that any wiring disarrangement will initiate the appropriate trouble signals via the main control panel per NFPA and U.L. requirements.

6. All wiring shall be installed in conduit. No A.C. wiring or any other wiring shall be run in the same conduit as fire alarm wiring. In existing areas not in mechanical rooms, use Wiremold surface raceway where exposed. Low smoke wiring complies with NEC Article 760 and approved by the local authority having jurisdiction may be installed without conduit above accessible ceilings if wiring is supported at structure with cable rings 48” on center. Do not support from data system cable rings.

7. All splices shall be in supported junction boxes. All auxiliary control circuits shall be connected to NAC type circuits and be supervised per NFPA. End-of-line supervisory devices shall be installed with the last device on the respective circuit. Said device shall be appropriately marked designating it as the terminating device on the respective circuit.

8. Wiring outside or between buildings shall be suitable for and installed properly for this application and comply with NEC Article 800. Provide isolation and surge suppression for all aerial and inter-building cables.

9. Wire shall be color coded in accordance with IPCEA Standards. Provide numbered labels on all wires entering annunciators, terminal boxes and the main control panel.

10. The minimum wire sizes to be used when not otherwise directed by Codes are as follows:

a.	Detector Circuits	AWG #18
b.	Remote Annunciators	AWG #18
c.	Remote Alarm Lamps	AWG #18
d.	Audible/Visual Signal Circuits	AWG #14 (up to 1.1 A) or larger as necessary
e.	120 volt or higher	AWG #12
f.	All other wiring	AWG #18

11. All systems shall be connected to an emergency power source as available.

12. All 120V emergency power circuits, electrical conduits, J-boxes, sleeves shall be furnished by the Division 26 00 00 electrical contractor. Should 120-volt emergency power be required other than at the main panel, General Contractor shall have Fire Alarm Contractor to coordinate with Electrical Contractor to include the cost of additional 120V dedicated emergency circuits in the base proposal.

13. Coordination with the Division 26 00 00 electrical subcontractor is the responsibility of the Fire Alarm Contractor and General Contractor to ensure all conduit and 120V emergency circuits are in place for a complete installation.

B. RACEWAY SYSTEMS

1. RACEWAY CAPACITY: It shall be the contractor's responsibility to determine the correct sizes of all type of raceway, to be installed, as instructed in the NEC and all applicable Codes.

2. See Section Electrical Wiring for conduit types and installation requirements. All fire alarm conduit shall be furnished by the Division 26 00 00 electrical contractor as part of their scope of work and shall meet Section 26 05 00 electrical wiring section requirements.

C. CEILING SUPPORTS: All devices installed in lay in ceilings shall have brackets to support device from ceiling tees.

D. MOUNTING HEIGHTS

1.	PULL STATIONS:	46" above finished floor to top
2.	ALARM SPEAKERS/FLASHERS:	80" or 6" below ceiling (or on ceiling)

E. LABELING: All devices shall be labeled with their system address.

2.07 TESTING

A. GENERAL: Contractor shall demonstrate to the Engineer that the system is operating in accordance with the project requirements. This will include testing of representative initiating devices, audibility checks and visual coverage of the school. This demonstration shall be performed after system testing and acceptance by the Fire Marshall. Any discrepancies noted during the demonstration shall be corrected by the Contractor. Prior this demonstration, contractor shall submit to the Engineer a copy of the Fire Marshall's acceptance and any corrective actions required by the Fire Marshall. System acceptance by the Owner's maintenance personnel does not eliminate this required demonstration.

B. REQUIREMENTS: All components and circuits of the fire alarm system shall be tested under operating conditions for proper functions. The testing shall demonstrate that all requirements as herein specified have been successfully accomplished, and that the system is fully operational. Testing shall include, but shall not be limited to, the following:

1. INITIATING DEVICES: Each initiating device shall be activated and proper operation of all visual and audible alarm and auxiliary devices shall be demonstrated.

2. DUCT AND PHOTOELECTRIC DETECTORS: Each detector shall be adjusted with electronic measuring equipment for calibration sensitivity. Each detector shall subsequently be checked for operation.

3. AUDIBLE ALARM DEVICES: Each audible alarm speaker shall be tested for proper operation, tone audibility, speech intelligibility and connection to the correct circuit.

4. Walk test to show in a printed report all AHU shutdown, Sprinkler Tamper Report,

C. TEST REPORT: Upon completion of testing, three copies of a report shall be submitted to the Owner containing the following information:

1. Complete as-built wiring diagrams

2. Detailed catalog data on all components of system

3. Ionization detector sensitivity settings

4. Certification of system performance and operation as specified

2.08 WARRANTY

A. System (materials and installation) shall be warranted for one year following substantial completion. Problem trouble shooting and repair shall begin within 24 hours of notification.

2.09 CLOSE-OUT DOCUMENTS

A. Provide the Owner with the following Close-Out Documents:

1. Two composite wiring diagrams of the system indicating point to point connections.

2. Two block diagrams of the system indicating conduit and number and size of wires between all devices, one to be placed in the control panel.

3. Three complete instructional/operational maintenance manuals.

4. Floor plan of building with correct room signage noting zoning, pull station and detector locations, acceptable to the Fire Marshall. Provide frame and install where directed by the Fire Marshall.

5. In addition to hard copies, provide AutoCad and PDF files in a CD.

6. Installer shall provide a backup copy of the installed program database on CD upon completion of the project. Installer shall also provide the current version of CD Software for the panel provided.

7. A list of spare parts.

PART 3

3.01 TRAINING

A. Provide four hours of instruction in proper operation and routine maintenance for the system. Instruction shall cover all materials indicated in the Owner's and operator's manuals. Contractor shall record training class in video. Save video to USB drive for Owner to use.

B. Operational guidelines shall be given in written form in sufficient numbers so that all key personnel have a copy.

END OF SECTION 28 31 00

SECTION 31 00 00
SITE EARTHWORK

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Operations required for the excavation and placement 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.

C. Work in this Section covers all site work not under proposed building slabs, mechanical equipment, or other specialized areas requiring a structural slab. Civil site work begins 5' outside the limits of proposed building slabs.

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 P R O D U C T S

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 E X E C U T I O N

3.1 REMOVAL OF TOPSOIL

A. Remove topsoil within the limits of the construction areas as shown on the Drawings.

B. Stockpile acceptable existing topsoil for future distribution. Protect stockpiled topsoil from other excavated materials. Contractor shall have existing topsoil tested for compliance with Division 32. Non-conforming topsoil shall be removed and disposed of off-site.

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 grade, 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 of embankment fills under pavement sections as specified in the section on stabilization of pavement subgrade, construction plans, and Geotechnical Report.

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 T 99.

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 T 99.

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 4 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 4 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

SECTION 31 06 20.15
CEMENT STABILIZED SAND

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Cement stabilized sand.

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 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.

B. Submit proposed target cement content and production data for sand-cement mixture in accordance with requirements of Paragraph 2.3, Materials Qualifications.

1.5 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 1.1 sacks of cement per ton of dry sand.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Cement: Type I Portland cement conforming to ASTM C 150.

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:
   1. f'c% 1/2 standard deviation

PART 3 E X E C U T I O N

3.1 PLACING

A. Place sand-cement mixture in maximum 8-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.

C. Where water lines cross wastewater lines, embed wastewater line with cement stabilized sand in accordance with Texas Administrative Code 290.44(e)(4)(B):
   1. Provide minimum of 10% cement per cubic yard of cement stabilized sand mixture, based on loose dry weight volume. Use at least 2.5 bags of cement per cubic yard of mixture (2 sacks per ton of dry sand).
   2. Unless otherwise shown on the Drawings, embed wastewater main a minimum of six inches above and below.

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 stabilized 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 tests (average of two specimens) have 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 3.3.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 that 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:
   1. 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

SECTION 31 06 20.17
UTILITY BACKFILL MATERIALS

PART 1 G E N E R A L

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). If Contract is 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 2.3, 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 2.3B.

B. Verification tests of backfill materials may be performed by Owner in accordance with Division 1.

C. Random fill obtained from the project excavation as a source is exempt from prequalification requirements by the Contractor but must be inspected and tested by the Geotechnical Testing Lab prior to use to insure material meets specifications.

PART 2 P R O D U C T S

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 2.1B, or by product descriptions, as given in Paragraph 2.2.

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: D_{60}/D_{10} - 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.

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 E X E C U T I O N

3.1 SOURCES

A. Use of existing material in trench excavations is acceptable, provided applicable specification requirements are satisfied. If on-site excavated materials are not acceptable for use as backfill, the Contractor shall provide from another source at no additional cost to the owner.

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 at the cost of the Contractor.

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

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S - Not Used

PART 3 E X E C U T I O N

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. Plants, trees and landscape features designated to remain.
   2. Utilities designated to remain.
   3. 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.
   3. Backfill and compact excavations with suitable backfill material as described in Division 31.

B. Clear undergrowth and deadwood without disturbing subsoil.

C. Remove vegetation from top soil scheduled for reuse.

D. Where clearing and grubbing has been performed in advance by others, Contractor shall perform such additional clearing and grubbing in the manner describe herein as required for

the construction of the facilities as described in this Contract at no additional cost to the Owner.

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 as shown on plans including buried concrete bases as required. 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

SECTION 31 20 00

EARTH MOVING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Stockpiling of stripped topsoil in an approved location.
   02 Excavating for foundations and other improvements.
   03 Providing stable and compacted subgrade below buildings, concrete work and other improvements.
   04 Providing stable and compacted subgrade at excavations resulting from removal of tree, foundations and other foreign, underground objects / material removed from the site.
   05 Placing and compaction of select fill and general fill under improved areas to conform to elevations designated on the Drawings.
   06 Filling and grading of the area around the building and improvements, using previously stripped topsoil, and any additional topsoil that must be purchased and delivered to the site.

C. Related Work:
   01 Section 01 45 23 – Testing and Inspection Services
   02 Section 02 32 00 – Geotechnical Investigation
   03 Section 31 11 00 – Clearing and Grubbing
   04 Section 31 22 19 – Finish Grading
   05 Section 31 23 33 – Trenching and Backfilling
   06 Section 31 32 13.19 – Lime Soil Stabilization

1.2 SUBMITTALS

A. Provide all submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Name and location of fill pit(s) proposed to be used to furnish fill for the Work.

C. Description and historical test reports of select structural fill proposed to be furnished.

D. If select fill is to be a blended composition, provide description of methodology to be used for blending, and ratios of each type of material to be blended.

E. Sample: provide a minimum of 1 cubic yard sample of proposed structural fill material deposited on site.
   01 This sample shall remain on-site through the fill process and be used to visually compare subsequent fill brought to the site.

F. Sample: provide a minimum of 1 cubic yard sample of proposed topsoil material deposited on site.
   01 Provide test results from an independent lab demonstrating the composition of topsoil meets or exceeds the specified requirements.

1.3 REFERENCES

A. American Society for Testing and Materials:
   01 ASTM D698-78 – Test for Moisture Unit Weight Relations of Soils and Soil Aggregate.
   02 ASTM D2922 – Tests for Density of Soil and Soil Aggregate in place by Nuclear Methods.
   03 ASTM D1557 – Moisture Density Relations of Soils and Soil-Aggregate Mixtures.

1.4 QUALITY ASSURANCE

A. Testing Laboratory Services – Test results shall meet or exceed the standards referenced.

B. Proposers shall examine the job sit conditions and be informed of all existing site conditions.

C. The Contractor will be required to establish, maintain and be responsible for all reference points, hubs, grades, elevations, lines, and surface measurements. If any discrepancies in the survey information furnished in the documents are found, the Contractor shall promptly notify the Architect and await instructions before proceeding.

PART 2 - MATERIALS

2.1 STRUCTURAL / SELECT FILL MATERIAL

A. Refer to Section 02 32 00 – Geotechnical Investigation Report.

B. Structural / select fill shall be lean clay, free from vegetation or other objectionable matter, reasonably free from lumps of the earth, and when tested in accordance with standard testing laboratory procedures shall meet the following requirements:
   01 The liquid limit shall not exceed 35.
   02 The plasticity index shall not be less than 10, and not more than 20.

C. If the only reasonable source of select fill provided from a source pit is a blend of sand and clay, the Contractor shall be solely responsible for quality control to assure that all material delivered to the project site matches the initial, approved test sample.
   01 Consult with Geotech Lab for requirements and recommendations.
   02 Blended material that does not conform to the properties of the initial, approved test sample may be rejected at the job site whether installed or not.
   03 Coordinate with the source pit as required to assure quality control is maintained for all select fill delivered to the project site.

D. Structural / select fill shall be used to construct 100% of the building pad plus 5 feet beyond the building foundation, including below adjacent paved / concrete areas, including the following:
   01 Service Yard.
   02 Main entry concrete flatwork.
   03 Sidewalks / concrete flatwork directly adjacent to the building foundation.

E. Structural / select fill minimum amounts and thicknesses:
   01 Building pad to 5’-6”, extended to 5’-0” outside the foundation perimeter:
   02 Service Yard: Same as building pad.
   03 Main entry concrete flatwork: 12”.

04 Sidewalks / concrete flatwork directly adjacent to the building: 12” if outside the 5’-0” limit.

F. Disturbed subgrade below the depth of the building pad shall be filled with structural fill material and compacted in lifts as required to bring the disturbed area / excavation to rough grade elevation.
01 Examples of disturbed subgrade areas includes but is not limited to: removal of unsuitable subgrade material, removal of existing trees, removal of existing buildings / foundations, removal of existing utilities, removal of tanks or similar foreign objects and materials.
02 The use of on-site material shall not be accepted.

2.2 NON-STRUCTURAL FILL MATERIAL

A. Non-structural fill shall be silty clay, free of vegetation or other objectionable matter, reasonably free from lumps of the earth, and when tested in accordance with standard testing laboratory procedures shall meet the following requirements:
01 The liquid limit shall not exceed 40.
02 The plasticity index shall not be more than 35.

B. Non-structural fill material may be used to achieve rough grades at paving / flatwork areas not adjacent to the building and other in unimproved areas.
01 Refer to Section 02 32 00 – Geotechnical Investigation Report and Section 31 32 13.19 – Lime Soil Stabilization for additional requirements for subgrade at paving and flatwork.

C. Disturbed subgrade below the depth of required subgrade at paving, flatwork, sidewalks, and new site utilities shall be filled with non-structural fill material and compacted in lifts as required to bring the disturbed area / excavation to rough grade elevation.
01 Examples of disturbed subgrade areas includes but is not limited to: removal of unsuitable subgrade material, removal of existing trees, removal of existing buildings / foundations, removal of existing utilities, removal of tanks or similar foreign objects and materials.

2.3 TOPSOIL

A. The Contractor shall furnish all topsoil that may be required to provide finish elevations and landscaping and sodding requirements.

B. During finish grading, provide a minimum of 2” of topsoil over all areas disturbed by construction activities. Refer to other sections for additional topsoil requirements at sports fields.

C. Topsoil shall be a proportional, homogeneous blend of fertile native soil, sand and organic matter / compost specifically blended for rapid grass growth with minimal to no clay.

D. Topsoil material shall consist of friable surface soil substantially free of grass, roots, weeds, sticks, stones and other foreign materials.
01 Maximum size of allowable stones: 3/4" diameter.
02 Earth / clay balls shall be broken down to a maximum size of 1-1/2” diameter.

E. Topsoil must be suitable for rapid grass growth and shall contain a minimal amount of clay.

F. Topsoil shall consist of a sandy loam with soil particles / composition within the following percentages:
   01 Clay: 0 to 10%
   02 Silt: 25 to 50%
   03 Sand: 50 to 70%
   04 Decomposed organic matter: 5 to 10%.

2.4 PREVIOUSLY STRIPPED ON-SITE TOPSOIL

A. Topsoil previously stripped and stockpiled may be used provided it meets all provisions of this Paragraph / Section.

B. Contractor shall treat existing / previously stripped topsoil to remove all undesirable vegetation, weeds and similar material not conducive to finish grading work and planting of new material / grass.

C. The Contractor shall have a representative sample of previously stripped topsoil tested to demonstrate the make-up, composition and suitability meets the requirements specified for topsoil.

D. If previously stripped topsoil does not meet the specified requirements for topsoil, all such material shall be removed from the site; and the Contractor shall provide imported topsoil that meets the specified requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Unknown Utilities and Obstacles:
   01 Prior to the start of excavation, coordinate with the Owner to identify and locate known underground utilities and potential obstructions.
   02 If any unknown or uncharted utilities or objects which would be utilities are encountered during excavation, promptly notify the Architect and Owner before proceeding.
   03 Do not proceed until all conflicts are fully resolved.

B. Clearing, Stripping and Grubbing: Refer to Section 31 11 00 – Clearing and Grubbing.

C. Protection of Trees:
   01 Where trees are indicated to remain, stop topsoil stripping at drip line to prevent main root system damage.
   02 In all construction areas, provide approved barricades around the drip lines of trees and shrubs, to protect them from construction operations until Substantial Completion, or until barricade removal is directed by Architect.
   03 Replace damaged trees and vegetation designated to remain with vegetation of equal kind and size. Follow supplier's recommended procedures for planting necessary replacement vegetation, and per direction of the Architect.

D. Excavating:
   01 Excavate to elevations and dimensions indicated and required, plus sufficient space to permit erection of forms, and select fill.

02 Footing: Floor and wall excavations shall be finished level. Protect bottom of excavation from frost. Shore and brace excavations, protect all slopes and earth banks, and provide sheet piling, if necessary, to prevent cave-in. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.

03 Grading: Contractor shall control the grading around building so that ground is pitched to prevent water from running into the excavated areas of building or damaging other structures. Furnish pumping required to keep excavated spaces clear of water during construction. If a foundation excavation must remain empty through a shut-down period, cover with boards and building paper, and clean out immediately prior to placing concrete. If any subgrade should be damaged due to flooding, damaged area shall be removed and filled with select fill. Placement and compaction of select fill shall meet the requirements for placing and compacting of select fill.

E. Preparation of Building and Paving Subgrade:

01 After the topsoil has been removed and stockpiled in an approved location and the subgrade has been grubbed and cut to proper elevation, scarify and compact the top 6 inches of existing subgrade to a dry density not less than 95%, nor greater than 98% Standard Proctor Density. Should the cut elevation be below the grubbing depth, scarify and compact the top with 6 inches of new subgrade to a dry density not less than 95%, nor greater than 98% Standard Proctor Density.

02 In areas where paving subgrade is on select fill, subgrade preparation may be performed as specified in part 3.2-A-03.

03 Unstable Areas: Proof roll the entire area with a rubber-tired vehicle such as a loaded 10-yard dump truck, large maintainer or other suitable vehicle weighing approximately 20 tons. If unstable areas are encountered, over-excavate and remove the unstable material and replace with the specified type of select fill. Placement and compaction of select fill in unstable areas shall meet the requirements for placing and compacting of select fill.

04 The subgrade shall be compacted using a sheep's foot roller or other approved methods which will assure bonding of layers of fill material.

05 Contractor shall be responsible for any damage caused to existing structure because of over-excavation or excavations left open during inclement weather.

06 Should the subgrade, due to any reason or cause, lose the required stability, density, or finish before the pavement structure is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

07 Preparation of Subgrade in Inclement Weather: The Contractor may encounter difficulty in densifying/preparing the surficial soil depending on weather conditions. If inclement weather causes the surficial soils to become unsuitably wet, the Contractor will have one of the following options:

a. Adequately dry the surficial soils by discing these materials.

b. Dry the surficial soils by blending hydrated lime or fly ash with the unsuitably wet soils.

c. Remove the unsuitably wet soils and replace the wet soil with select fill having an acceptable moisture content.

This option will be entirely up to the Contractor. No extra will be paid by the Owner.

3.2 PLACEMENT

A. Select Fill:

01 Use under all building slabs, paving, sidewalks or other improved areas requiring fill, and to replace unstable subgrade.

02 Provide and place select fill when existing subgrade is in satisfactory condition, as determined by the testing laboratory.

03 Place under laboratory control, in layers of not more than 8 inches in loose thickness, at moisture contents at or above optimum, and compacted to densities of at least 95% of Standard Proctor Density, as determined by ASTM D698 test procedure and within 2% of optimum moisture content.

04 Compaction of the select fill shall be accomplished by means of sheep's foot rollers or other approved methods which will assure bonding of layers of fill material.

B. General Earth Fill:

01 During construction, perform rough grading as required to provide positive drainage of the site.

02 Place general fill and rough grading in unimproved areas.

03 Rough grade to achieve elevations indicated allowing for installation of required top soil, landscaping and sodding.

04 Compact rough graded areas to densities of at least 90% of Standard Proctor Density, as determined by ASTM D698 test procedure and within 2% of optimum moisture content.

05 Re-grade and re-compact any areas that do not retain grade prior to placement of top soil.

06 Refer to Section 31 22 19 – Finish Grading.

C. Topsoil Fill:

01 Topsoil shall be provided at all areas to receive sod, hydro-mulch application and all other vegetation areas.

02 Minimum depth shall be 2”; and more where indicated on the Drawings.

03 Upon completion of final grading and confirmation of adequate site drainage, place topsoil at all required areas.

04 Final grading shall account for the additional installation of topsoil; as well as the thickness of solid sod and / or mulch to be placed on the topsoil.

05 Topsoil shall not be compacted.

06 Hand rake topsoil as required to achieve an even surface of the required topsoil depth(s).

PART 4 - TESTING LABORATORY SERVICES

A. Refer to Section 01 45 23 – Testing and Inspection Services.

B. Testing lab services shall be provided by a lab under direct contract with the Owner. Contractor shall be responsible for scheduling all testing services required for excavation and fill.

C. Each lift of select fill and general fill shall be tested.

D. The Contractor shall be solely responsible for remedy of non-compliant materials and / or test results, including proceeding with subsequent fill installation prior to receiving conclusive test reports from the lab.

END OF SECTION

SECTION 31 22 00
SITE GRADING

PART 1 G E N E R A L

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.

B. For sites located in the 100-year Floodplain, the Contractor shall provide an As-Built Survey of all work (cut or fill) located within the 100-year Floodplain. Survey shall be signed and sealed by a Registered Land Surveyor and be on the same survey datum as the design drawings.

1.4 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

C. Protect survey bench marks and control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Topsoil - Soil Type: Topsoil excavated on-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.
      c. On-site topsoil may be used. Contractor shall have on-site topsoil test and analyzed for compliance with Division 32. It is the Contractor's responsibility to add approved imported topsoil as required to achieve grades and specified depth at no additional cost to the Owner.
   2. Other Fill Materials: Reference relevant sections of Division 32 and the Drawings.

PART 3 E X E C U T I O N

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. Damage to existing drainage structures will be corrected by Contractor at no additional cost to the Owner.

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 re-graded, 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: 4 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).

C. When grading drainage areas to drainage structures (inlets), the area must have a uniform slope to drainage structure. Steep drop-offs into drainage structures will not be allowed.

3.7 FIELD QUALITY CONTROL

A. See Division 1 and Division 31 for compaction density testing.

B. Contractor shall coordinate site inspection with Owner/Architect/Engineer prior to placement of final topsoil and landscape materials.

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, and ready to receive landscaping.

END OF SECTION

SECTION 31 22 19

FINISH GRADING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Fine grading to meet required finish elevations indicated on the Drawings; distribution of top-soil over the site; and coordination with installation of sodding and landscaping.
   02 Disc the existing and / or filled subgrade to a depth of 6 inches using a landscape scarifier.
   03 Remove all roots, rocks, stumps, trash and all construction debris prior to finish grading.
   04 Following the removal of all foreign materials, and when the rough grading is completed, provide and place previously stripped material or silty or sandy clay material in the amounts required to bring the rough grade to within 2 inches of finish grade.
   05 Assure bonding of layers of fill material by discing in compliance with the specifications.
   06 Spread 2 inches of topsoil over graded areas after rough grading has been completed and approved.
      a. Topsoil previously stripped and stockpiled may be used, provided it meets all requirements for topsoil (Refer to Section 31 22 00 – Earth Moving).
      b. The Contractor shall furnish all additional topsoil that may be required to provide finish elevations.
      c. Existing topsoil and additional topsoil fill material shall be free of debris, stumps, roots and stones larger than 3/4 inch diameter.
      d. Samples of topsoil shall be submitted to the Architect and Owner for approval prior to installation.
      e. Topsoil must be suitable for rapid grass growth with little to no clay.
   07 Final and fine grading shall be done using a tractor pulled landscape rake and hand raking, removing all debris immediately prior to landscaping / hydro-mulching. The final graded ground surface shall be relatively smooth, free of organic material and all construction material debris; and in suitable condition to commence landscaping work.

C. Related Work:
   01 Section 02 32 00 – Geotechnical Investigation
   02 Section 31 11 00 – Clearing and Grubbing
   03 Section 31 20 00 – Earth Moving
   04 Section 32 92 13 – Hydro-mulching
   05 Section 32 92 23 – Sodding
   06 Section 32 93 00 – Landscaping

1.2 PROJECT CONDITIONS

A. The Contractor will be responsible to maintain and control the grading around the building so that the grade is sloped to prevent water from ponding adjacent to or entering the building and / or accumulating in the graded areas throughout the progress of the Work.

B. Utilities and other remaining obstacles shall be properly identified prior to commencement of the final grading.

1.3 QUALITY ASSURANCE

A. Testing Laboratory Services. Test results shall meet or exceed the standards.

B. American Society for Testing and Materials:
   01 ASTM D698-78, Test for Moisture Unit Weight Relations of Soils and Soil Aggregate.
   02 ASTM D2922, Tests for Density of Soil and Soil Aggregate in place by Nuclear Methods.
   03 ASTM D1557, Moisture Density Relations of Soils and Soil-Aggregate Mixtures.

PART 2- PRODUCTS

2.1 MATERIALS

A. Refer to Section 31 20 00 – Earth Moving for description of fill and topsoil materials.

PART 3- EXECUTION

3.1 FIELD QUALITY CONTROL

A. Preparation:
   01 Upon completion of grading and prior to placement of topsoil, Contractor shall thoroughly remove all construction debris, weeds, foreign plants, rocks 3/4" diameter or larger, and other non-soil materials.
   02 Remove by hand or hand rake if / where necessary.

B. Inspection:
   01 The Contractor, prior to placing any topsoil, shall contact the Architect and Owner when the grading is complete and all foreign materials have been removed, to review these areas for compliance with the contract requirements.
   02 Prior to placement of any topsoil, the Architect and Owner will review with the Contractor the areas designated complete and ready for final grading.
   03 The topsoil installation shall proceed immediately when the designated areas have been reviewed and determined acceptable.
   04 The Contractor shall contact the Architect and Owner to review the areas when the topsoil has been placed, debris removed, and all final grading has been completed.
   05 This review shall occur prior to any sodding, seeding, hydro-mulching, and/or other landscaping operations proceeding within these designated areas.
   06 Any construction materials, discovered or uncovered during and / or after the landscaping / sodding operations, shall be the responsibility of the Contractor to remove and replace each area to its finished condition.

3.2 INSTALLATION

A. Work under this Section consists generally of the following operations:
   01 Disc the existing and / or filled subgrade to a depth of 6 inches using a landscape scarifier.
   02 Place topsoil material in the amounts required to bring the rough grade to within 2” of finish sodded grade; and within 1” of areas to receive hydro-mulch.
   03 Assure bonding of layers of fill material by discing in compliance with the specifications.
   04 Final and fine grading shall be done using a tractor pulled landscape rake and hand raking, removing all debris immediately prior to landscaping / sodding / hydro-mulching. The final graded ground surface shall be relatively smooth, free of organic material and all construction material debris; and in suitable condition to commence landscaping work.

B. Solid Sodded Areas:
   01 Grading at areas to receive solid sodding shall account for nominal thickness of root base / soil included in the solid sod blankets.
   02 Grading at solid sodded area at building perimeter shall result in top of grass blanket soil flush with the bottom of the brick ledge, sidewalks and flatwork; unless shown otherwise on the Drawings.
   03 Sodding shall not impede the drainage of water off or over sidewalks and flatwork.
   04 Where solid sodding adjoins areas of hydro-mulched sodding, grade area to provide a level transition from one sodded area to the other after grass / hydro-mulch is established and fully rooted.

3.3 PROTECTION AND MAINTENANCE

A. The Contractor shall be responsible for protecting and maintaining completed finish grading prior to the start of sodding and landscape Work.

B. Damage caused by surface run-off, construction vehicular traffic, use of equipment or other Contractor controlled activities shall immediately be repaired and restored to originally accepted state.

END OF SECTION

SECTION 31 23 16.14
TRENCH SAFETY SYSTEM

PART 1 G E N E R A L

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). If 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.

D. Trench Safety Program is the safety procedures governing the presence and activities of individuals working in and around trench excavations.

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. The Engineer/Owner will not provide approvals or disapprovals of submittal but will retain for records.

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).

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), judgments or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.

B. Contractor acknowledges and agrees that this indemnity provision provides indemnity for the Owner in case the Owner is negligent either by act or omission in providing for trench safety, including, but not limited to safety program and design reviews, inspections, failures to issue stop work orders, and the hiring of the Contractor.

PART 2 P R O D U C T S – Not Used

PART 3 E X E C U T I O N

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

SECTION 31 23 33
EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 G E N E R A L

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). If Contract is 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 backfill material sources and product quality information in accordance with requirements of Division 31.

C. Submit trench excavation safety program in accordance with requirements of Division 31. Include designs for special shoring as required.

D. 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.

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 P R O D U C T S

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 1.8, 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 E X E C U T I O N

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.

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.). Minimum trench width shall be wide enough to allow for hand tamping of backfill material under haunch of pipe.

Nominal Pipe Size, Inches	**Minimum Trench Width, Inches**
12” and Less	O.D. + 18”
15” 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 Government regulations.

H. Voids under 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.

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 3 feet 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, over excavate an additional 6 inches. 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 3.7B 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. Backfill material shall be hand tamped under haunch of pipe to insure backfill material totally encases pipe.

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 line 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 and inspections.

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 8-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 8-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 12 inches below base, minimum 12 inches 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 1 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

SECTION 31 31 16

TERMITE CONTROL

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide termite control treatment below foundation on grade prior to placement of vapor membrane.
   02 Extend treatment to 5’-0” outside of building perimeter.

C. Related Work:
   01 Section 31 20 00 – Earth Moving

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer’s literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.
   01 Manufacturer’s product data for all products proposed to be furnished, including copy of EPA registration and MSDS sheets.

C. Installation Instructions: Submit manufacturer’s complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Include application strengths / rates for all areas to be treated (i.e. building pad directly below slab, grade beams, etc.).
   02 Submit actual quantities (gallons) to be furnished for each application.

D. Affidavit: Submit a signed affidavit immediately following application of termite treatment, attesting the specification compliance of the chemicals, their proportions, and application.

E. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 QUALITY ASSURANCE

A. Comply with all applicable governmental standards for use and storage of these materials. Use these chemicals for this Work only. Unauthorized use of these chemicals is strictly forbidden.

B. Subcontractors Qualifications:
   01 Applicator shall be bonded to perform this type of Work.
   02 Where local licensing is available or required, applicator shall be licensed to perform this type of Work.

1.4 WARRANTY

A. Warranty the Work specified herein for five (5) years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.
   01 The warranty shall include a one (1) year damage guarantee for repair / replacement of any damaged building materials caused by termites.
   02 The warranty shall include an additional four (4) year service guarantee against termite activity within the affected area.

PART 2 - PRODUCTS

2.1 PRODUCT OVERVIEW

A. Poison Diluent: Portable water.

B. Treatment Chemical / Products:
   01 Imidacolprid / Premise 75.
   02 Fipronil / Termidor HE.
   03 Altiset Termiticide / Chlorantraniliprole.
   04 Biflex Termiticide / Bifenthrin.

C. Other equal product containing the specified chemical(s) as submitted and approved by the Architect.

D. Provide color additive for a visual indication of areas treated.

E. Only one product shall be used for all termite control treatment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Quantities of Working Solution: Shall be as recommended by the manufacturer for this specific application.

B. Procedures:
   01 Notify the supervising authority before commencing Work.
   02 Do not apply poison to soils that are excessively wet.
   03 Apply solution immediately prior to placing vapor barrier or waterproofing membrane.
   04 In the event of rain prior to placement of concrete, re-apply solution in accordance with manufacturer’s specifications and recommendations.

C. Upon completion of the entire slab-on-grade area, furnish the required affidavit and warranty.

END OF SECTION

SECTION 31 32 13.19

LIME SOIL STABILIZATION

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide soil stabilization below and to 36” beyond the limits of the following areas:
      a. Concrete paving parking areas, driveways and approaches
      b. Mechanical and kitchen service yards.
      c. Concrete flatwork areas, excluding sidewalks.

C. Related Work:
   01 Section 02 32 00 – Geotechnical Investigation
   02 Section 03 30 00 – Cast-In-Place Concrete
   03 Section 31 20 00 – Earth Moving
   04 Section 32 13 13 – Concrete Paving

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer’s literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Mix Design: Provide proposed mix designs to achieve required percentage when mixed with substrate fill material.

D. Installation Instructions: Submit manufacturer’s complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.

1.3 REFERENCES

A. ASTM International:
   01 ASTM C911 – Standard Specification for Quicklime, Hydrated Lime, and Limestone for Selected Chemical and Industrial Uses.
   02 ASTM C977 – Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
   03 ASTM D698 – Tests for Moisture-Unit Weight Relations of Soils and Soil Aggregate.

B. Texas Highway Department Publications: Standard Specifications for Construction of Highways, Streets and Bridges
   01 Item 260 – Lime Treatment (Road Mixed)

02 Item 263 – Lime Stabilization (plant Mixed)

C. Texas Department of Transportation Departmental Material Specifications (DMS), latest edition:
01 DMS 6350 – Lime and Lime Slurry.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Contractor responsible to coordinate with the testing agency prior to start of Work requiring testing so as to minimize unnecessary cost or delays to the project.

C. Testing:
01 Owner will retain and pay a qualified Materials Testing Laboratory to take all field samples and do all laboratory testing necessary to verify compliance of the work to these Specifications or as required by City or other regulatory agencies.
02 All tests shall be performed by the Materials Testing Laboratory Materials Testing Laboratory in accordance with ASTM D 698, D1556, or other test method selected by Geotechnical Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lime Slurry:
01 Lime slurry for use in treating the subgrade shall conform to the chemical and physical requirements listed in Tables 1 and 2 of TxDOT Departmental Material Specification (DMS) 6350 for Commercial Lime Slurry.
02 Lime Slurry may be prepared at the job site or other Owner approved location by using Hydrated Lime or Quicklime as specified by chemical and physical requirements in Tables 1 and 2 of TxDOT Departmental Material specifications (DMS) 6350.

B. Water:
01 Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter or other substances injurious to the finished product.
02 Water sources other than the local municipal domestic water supply must be approved by the Civil Engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. After preparatory work specified under Section 31 20 00 – Earth Moving has been satisfactorily completed and approved by the Testing Laboratory, a minimum of 6 inches of earth material which occurs at the top of the existing subgrade beneath all scope areas listed in Paragraph 1.1 shall be scarified, and a stabilized subgrade be installed.
01 Extend stabilization a minimum of 3 feet beyond the edge of the required areas.

B. Construction methods shall conform to the applicable specifications of the TxDOT specifications, Item 260, Lime Treatment.

C. Lime shall be spread only on that area where the first mixing operations can be completed during the same working day.

3.2 APPLICATION

A. The percent of lime to the dry weight of the soil shall be a minimum of six percent (6%). Refer to Section 02 32 00 - Geotechnical Investigation.

B. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry.

C. The distribution of lime shall be uniformly placed in such quantity that all soil to be treated receives the minimum percentage of lime and successive passes made until the proper moisture and lime content is obtained.

D. The distributor truck shall be equipped with an agitator which will keep the lime and water in uniform mixture unless the prescribed consistency can be otherwise maintained. If an agitator is not used, a standby pump shall be available at the site for agitating the lime and water in case of delays in dispersing the slurry.

3.3 MIXING

A. The material and lime shall be thoroughly mixed by approved road mixers until a homogeneous, friable mixture of material and lime is obtained, free from all clods or lumps.

B. Immediately after the "first mixing" operation, the mixture shall be brought to the proper moisture content and sealed with a light pneumatic rubber tire roller and left to cure for 1 to 4 days, as directed by the Owner. If rework is required to obtain compaction after 72 hours of the last mixing, add 25% of the specified rate of lime.

C. After curing time the material shall be uniformly mixed. All clods shall be reduced in size by raking, blading, discing, harrowing, scarifying or other approved method.

3.4 COMPACTION

A. Compaction of the mixture shall begin immediately after final mixing and in no case later than 3 calendar days after final mixing.

B. The moisture content at time of compaction shall be at optimum to four percent (4%) above optimum.

C. The mixture when used as pavement subgrade shall be compacted by sheepsfoot rollers or 25 ton pneumatic self-propelled rollers until a minimum density of 95% of Standard Maximum Density (ASTM D698-07e1) is obtained.

END OF SECTION

SECTION 32 11 13.13
LIME-TREATED SUBGRADES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Foundation course of lime stabilized natural subgrade material.

1.2 UNIT PRICES

A. Stipulated Price Contracts. Include payment for work under this section in the 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.

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 with specifications.

E. Soil will be evaluated to establish percent of hydrated lime, quicklime, or lime slurry to be applied to subgrade material.

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 P R O D U C T S

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 following grades:
   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 a 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 E X E C U T I O N

3.1 EXAMINATION

A. Verify compacted subgrade is ready to support imposed loads.

B. Verify subgrade lines and grades are correct.

3.2 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Cut material to bottom of subgrade using an approved cutting and pulverizing machine meeting following requirements:

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 subgrade. Remove material or windrow to expose secondary grade. Correct wet or unstable material below secondary grade by scarifying, adding lime, and compacting. Obtain uniform stability.

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 1.6C 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 subgrade will contain a minimum lime content by weight of dry subgrade as instructed by Testing Laboratory and detailed in Geotechnical Report.

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 and lumps.

C. Shape mixed subgrade to final lines and grades.

D. Eliminate following operations and final mixing if pulverization requirements of Paragraph 3.5C can be met during preliminary mixing:
1. Seal subgrade as a precaution against heavy rainfall by rolling lightly with light pneumatic rollers.
2. Cure soil-lime material for 1 to 4 days. Keep subgrade moist during cure.

E. Stabilized subgrade shall extend a minimum of two feet beyond edge of pavement or back or curb as applicable.

3.5 FINAL MIXING

A. Use approved single-pass or multiple-pass rotary speed mixers to uniformly mix cured soil and lime to required depth.

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 subgrade 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 95 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. Subgrade 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 subgrade 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 a 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 subgrade.

3.10 PROTECTION

A. Maintain stabilized subgrade 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

SECTION 32 11 29.13
LIME-FLY ASH-TREATED BASE COURSES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Foundation course of lime/fly ash stabilized subgrade material.
   1. Application of lime slurry and fly ash to subgrade.
   2. Mixing, compaction, and curing of lime, slurry, fly ash, water and subgrade into a stabilized foundation.

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 DEFINITIONS

A. Moist Cure: Curing soil lime/fly ash material to obtain optimum hydration.

B. 1000-Foot Roadway Section: 1000 feet per lane width or approximately 500 square yards of compacted subgrade for other than full-lane-width roadway sections.

1.4 REFERENCES

A. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.

1.5 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit certification that fly ash, hydrated lime, quicklime, or commercial lime slurry complies with these specifications.

C. Submit weight tickets, certified by supplier, with each bulk delivery of materials to work site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Conform to requirements of Division 2.

B. Quicklime can be dangerous; exercise extreme caution if used for Work. Become informed about recommended precautions in handling, storage and use of quicklime.

PART 2 P R O D U C T S

2.1 MATERIALS

A. Water: clean, clear and free from oil, acids, alkali, or vegetable matter.

B. Conform to requirements of City of Houston Standard Specifications Section 02336 – Lime Stabilized Subgrade for Type A hydrated lime, Type C quicklime, and Type B commercial lime slurry.

C. Fly ash: Residue or ash remaining after burning finely pulverized coal at high temperatures conforming to requirements of ASTM C 618, Type ‘C” or “F” and following:
   1. Minimum CaO content of 20 percent
   2. Loss on ignition not to exceed 3 percent
   3. Contain no lignite ash

D. Asphaltic Seal Cure: Conform to requirements of Division 32.

PART 3 E X E C U T I O N

3.1 INSTALLATION

A. Conform to City of Houston Standard Specifications Section 02336 – Lime Stabilized Subgrade with following exceptions:
   1. Include fly ash in percentage amounts in lime or lime slurry as established from geotechnical evaluation for application, mixing, and compaction.
   2. Apply lime/fly ash as single mix, single pass over lower PI soils.
   3. Conduct operations to minimize elapsed time between mixing and compacting lime/fly ash stabilized subgrade in order to take advantage of rapid initial set characteristics. Complete compaction within 2 hours of commencing compaction and not more than 6 hours after adding and mixing last stabilizing agent.

B. Stabilized subgrade shall extend two feet beyond edge of pavement or back of curb as applicable.

3.2 QUALITY CONTROL

A. Testing will be performed under provisions of Division 1.

B. Soil will be sampled to establish percent of fly ash and hydrated lime, quicklime, or lime slurry to be applied to subgrade material.

C. Testing will be in accordance with Division 1.

END OF SECTION

SECTION 32 12 16

ASPHALTIC PAVING

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide asphaltic paving where indicated on the Drawings.
   02 Coordinate with concrete paving contractor as required for proper interface of asphaltic to concrete paving.

C. Related Work:
   01 Section 01 45 23 – Testing and Inspection Services
   02 Section 02 32 00 – Geotechnical Investigation
   03 Section 02 41 19 – Selective Demolition
   04 Section 03 30 00 – Cast-In-Place Concrete
   05 Section 31 11 00 – Clearing and Grubbing
   06 Section 31 20 00 – Earth Moving
   07 Section 31 22 19 – Finish Grading
   08 Section 31 23 33 – Trenching and Backfilling
   09 Section 31 32 13.19 – Lime Soil Stabilization
   10 Section 32 13 13 – Concrete Paving and Flatwork

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Provide profiles and locations of all proposed asphaltic paving.
   02 Provide details of field installation with adjacent Work.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

1.3 REFERENCES

A. The current editions of the following documents govern the Work, except where more restrictive items are specified.

B. Standard Specifications for Construction of Highways, Streets, and Bridges by Texas Highway Department.

C. Asphalt Institute Publications.

D. American Society for Testing Materials:
   01 ASTM C29 – Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
   02 ASTM C88 – Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
   03 ASTM C117 – Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
   04 ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
   05 ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
   06 ASTM D2419 – Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

E. Texas Highway Department, Item 300.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lime Stabilization:
   01 Refer to section 02 32 00 – Geotechnical Investigation Report
   02 Refer to section - 31 32 13.19 – Lime Soil Stabilization
   03 Texas Highway Department, Item 260 and 264.
   04 Hydrated Lime, ASTM C415.

B. Base Course: Item 2342 Crushed Stone, Type A, Grade 1, Limestone, 8" minimum compacted thickness.

C. Surface Course:
   01 Minimum 2” asphaltic paving thickness.
   02 Texas Highway Department. Item 340, Class A, Type D, fine graded.
   03 Type: Hot mix, hot-laid asphalt concrete.
   04 Aggregate: Well graded mixture of clean shell, crushed stone, sand, crushed limestone, and mineral filler, all passing 1/2 inch sieve. Provide a mixture of aggregate and liquid asphalt mixed in such proportions that the percentage by weight will be within:

Sieve Sizes	Percentage Passing
1/2"	100%
3/8"	67-85%
1/4"	50-65%
No. 8 mesh	37-50%
No. 30 mesh	15-25%
No. 200 mesh	3-8%

plus 50/60 penetration liquid asphalt at 5% to 6-1/2 inches of the combined dry aggregates.

05 Mixing:
- a. Asphalt Quantity: 4% to 8%, by weight, of the total mixture.
- b. Design: For lab density of 94-98% by Hveem method.
- c. Mixing Time: Sufficient to coat all particles with asphalt.

06 Tack Coat:
- a. Type: Cut-back asphalt.
- b. Spec: MC-1 or RC-2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placement of Base Courses:

01 Subgrade Stabilization:
- a. Spread stabilizer uniformly over area and as specified in Section 31 32 13.19 – Lime Soil Stabilization.
- b. Compact to 95% Standard Density (AASHO T-99) at optimum moisture.

02 Thickness Tolerance: Provide compacted thicknesses shown on the Drawings within a tolerance of -0.0 inch to +0.5 inch.

03 Smoothness Tolerance: Provide lines and grades shown on the Drawings within a tolerance of 3/8 inch in ten feet.
- a. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

04 Moisture Content: Use only the amount of moisture needed to achieve specified compaction.

B. Placing Topping:

01 Temperature: Provide mix at minimum 225°F, when dumped from mixer.

02 Clean Base: Remove loose material, dust, dirt and other foreign materials from the base course.

03 Tack Coat: Apply .05 to .2 gal. per sq. yd.

04 Compaction: Compact topping to 95% by on-site Hveem test.

05 Stability: 35-40% by Hveem test.

06 Thickness of Topping After Compaction: 2” minimum; adjust as required to obtain grade for drainage.

C. Field Quality Control:

01 Surface: Smooth, hard and well cemented to base course.

02 Grades: Conform to those shown.

03 Accuracy: Free of puddles deeper than 1/2 inch where designed for a slope of at least 1/4 inch per foot.

04 Refer to Section 01 45 23 - Testing and Inspection Services.

END OF SECTION

SECTION 32 13 13.00
CONCRETE PAVING

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Portland cement concrete paving.

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 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. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

T. ASTM C 618 - 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 compressive 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 P R O D U C T S

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:

Item	Percentage by Weight of Total Sample Maximum
Clay lumps and friable particles	3.0
Material finer than 75-µm (No. 200) sieve:	
Concrete subject to abrasion	3.0*
All other concrete	5.0*
Coal and lignite:	
Where surface appearance of concrete is of importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than 75-µm (No. 200) sieve consists of dust of fracture, essentially free from clay or shale, these limits may be increased to 5 and 7 percent, respectively.

2. Conform coarse aggregate (size 1 1/2 inch to No. 4 sieve) to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 1¾" sieve	0
Retained on 1½" sieve	0 to 5
Retained on ¾" 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:

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.

E. Mineral Filler: Type "C" or Type "F" fly ash of acceptable quality and meeting requirements of ASTM C 618 may be used as mineral admixture in concrete mixture 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.

F. Air Entraining Agent: Furnish air entraining agent conforming to requirements of ASTM C 260.

G. Water Reducer: Water reducing admixture conforming to requirements of ASTM C 494 may be used when required to improve workability of concrete. Amount and type of admixture is subject to approval by Owner's Representative.

H. 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

A. Conform Equipment to requirements of ASTM C 94.

2.3 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: Compressive strength greater than or equal to 3,500 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 E X E C U T I O N

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. Machine Finisher: Provide power-driven, transverse finishing machine designed and operated to strike off and consolidate concrete. Machine shall have two screeds accurately adjusted to crown of pavement and with frame equipped to ride on forms. Use finishing machine with rubber tires when it operates on concrete pavement.

D. Hand Finishing:
1. Provide mechanical strike and tamping template 2 feet longer than width of pavement to be finished. Shape template to pavement section.
2. Provide two bridges to ride on forms and span pavement for finishing expansion and dummy joints. Provide floats and necessary edging and finishing tools.

E. Burlap Drag or transverse broom for Finishing Slab: Furnish four plies of 10 ounce burlap material fastened to bridge to form continuous strip of burlap full width of pavement. Maintain contact 3 foot width of burlap material with pavement surface. Keep burlap drags clean and free of encrusted mortar.

F. 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.

G. 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 2 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.

D. Concrete finish shall be complete in a uniform, workman like manner. Excessive roughness from burlap or broom finishing may be cause for removal and replacement from Owner.

E. Contractor shall immediately clean any concrete spillage from existing pavements. If concrete spillage is allowed to dry on existing pavements, it shall be the Contractor's responsibility to remove the excess concrete and repair the existing concrete to like-new condition. Owner may reject repairs and require removal and replacement of the area.

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 at 7 days 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 3,500 pounds per square inch.

E. Request, at option, three additional cores in vicinity of cores indicating nonconforming in-place 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 UNIT PRICE ADJUSTMENT

A. The Owner may chose to adjustment payment for nonconforming concrete.

3.16 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.

3.17 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

SECTION 32 13 13.10
CONCRETE PAVEMENT CURING

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Curing of Portland cement concrete paving.

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 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 P R O D U C T S

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 E X E C U T I O N

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

SECTION 32 13 16

DECORATIVE CONCRETE PAVING

CONDITIONS OF THE CONTRACT, SECTIONS AA THROUGH CB AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. to Proposers, Section AF – Subcontractor / Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Reference drawing for concrete pattern and metal inserts at exterior courtyards.

C. Related Work:
   01 Section 01 45 23 – Testing and Inspection Services.

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Mill Certificates. Required for all bulk cement.

C. Design Mixes. Submit test data on proposed design mixes for each type of concrete in the project.

D. Admixtures. Submit brochures on admixtures proposed for use if different from those specified.

E. Mock-up. Prepare a 2' x 2' sample of colored concrete indicating each proposed color, finish and workmanship to be expected in completed Work. Approved sample will be used as standard of comparison for the project.

F. Color to match one of the three colors of masonry on building.

1.3 QUALITY ASSURANCE

A. Codes and Standards. All concrete shall be in strict accordance with the latest edition of ACI 301 unless otherwise specified. Any procedure, material or operation specified by reference to the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), local building code or other reference, shall comply with the requirements of the current and most recent specification or standard.

B. Responsibility for conformance to the above referenced specifications and standards rests solely with the Contractor.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I.

B. Aggregates:

01 Normal-Weight (Stone) Concrete: Comply with ASTM C33:

a. Fine Aggregates. Clean sharp natural sand free from loam, clay lumps or other deleterious substances.

b. Coarse Aggregates. Clean, uncoated gravel containing no clay, mud, loam or foreign matter.

c. Maximum Aggregate Size. Not larger than 1/5 of the narrowest dimension between sides of forms, 1/3 of the depth of slabs, nor 3/4 of the minimum clear spacing between individual reinforcing bars. Maximum aggregate size shall in no case be larger than 1-1/2 inches.

C. Air-Entraining Admixture: ASTM C260, Cormix "Air-Tite," Master Builders "MB-VR," Sika "AER," Protex Industries "Protex Air Engraining Solution" or approved equal.

D. Water: Potable.

E. Curing Materials: Curing Compound for Colored Concrete. As recommended by manufacturer.

F. Color Hardener: Equal to "Bomanite". Color as selected by Architect.

PART 3 - EXECUTION

3.1 CONCRETE PLACEMENT

A. Place concrete in compliance with the practices and recommendations of ACI 304 and as specified herein.

B. Before placing concrete, inspect form work, steel and items to be embedded or cast-in. Clean and coat all contact surfaces of forms, remove all debris and excess water from forms, and wet all wood forms.

C. Handle concrete from point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit as rapidly as practicable by methods which will prevent segregation and loss of concrete mix materials.

D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to re-handling or flowing.

E. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Vibration of forms and reinforcing will not be permitted. Do not use vibrators to transport concrete inside forms.

F. Placing Concrete Slabs. Deposit and consolidate concrete in slabs in a continuous operation within the limits of construction joints until placing of a panel or section is completed. Bring slab surfaces to correct level.

G. While concrete is still in the plastic stage of set, Bumanite imprinting tools shall be applied to make the desired impression to the surface to provide continuous interlocking uninterrupted pattern.

3.2 JOINTS

A. Construction Joints. Locate and install construction joints, which are not shown on the Drawings, so as not to impair strength and appearance of the structure, as approved by the Architect.

3.3 CONCRETE SURFACE REPAIRS

A. Repair exposed-to-view formed concrete surfaces, where possible, that contain defects which adversely affect the appearance of the finish. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets and holes left by rods and bolts; fins and other projection on the surface; and stains and other discolorations that cannot be removed by cleaning.

3.4 CONCRETE CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.

B. Perform curing of concrete by manufacturer's instructions.

C. Apply Bomanite recommended Colorwax in accordance with manufacturer's printed instructions in colors to match the colored concrete selected.

END OF SECTION

SECTION 32 13 73
CONCRETE PAVING JOINTS AND SEALANT

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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 E X E C U T I O N

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 60 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 CONSTRUCTION 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.

B. Required only if noted on plans.

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.

B. Required only if noted on plans.

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 12 hours of concrete placement. Saw joints at required spacing (15' maximum between sawed joints) 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.

C. Reference plans for requirements on sealing sawed joints.

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.

B. Expansion joints in curbs shall be sealed to match expansion joints in pavement.

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.

B. Sidewalk expansion joints shall be sealed to match expansion joints in pavement.

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.

B. Driveway expansion joints shall be sealed to match expansion joints in pavement.

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

SECTION 32 16 13
CURBS AND GUTTERS

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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, non-shrink grout containing no chloride producing agents conforming to the 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 E X E C U T I O N

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

SECTION 32 31 00

ORNAMENTAL CANTILEVER GATE SYSTEM

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Design, fabrication and installation of ornamental cantilever gates.
   02 Refer to drawings for fencing locations, panel design and gate sizes and locations.
   03 Provide all materials and accessories required for a complete installation.

C. Related Work:
   01 Section 01 25 00 – Substitution Procedures
   02 Section 01 33 00 – Submittals Procedures
   03 Section 32 13 13 – Concrete Paving

1.2 SUBMITTALS

A. Review and comply with all provisions of section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete shop drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Provide calculations demonstrating compliance with wind load and other requirements.
   05 Shop drawings shall be sealed and signed by a Texas registered engineer.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the work of this contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:

01 Provide two (2) samples of each finish for selection by the Architect.
02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
03 Minimum size shall be 3” x 3” but must be large enough to convey attributes of the proposed product.

G. Operations and Maintenance Manuals:
01 Provide complete operations and maintenance manuals to the Owner.
02 Refer to section 01 78 23 – Operations and Maintenance Manuals
03 O & M manuals must be reviewed, accepted and delivered to the Owner prior to Owner demonstration(s).

H. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.4 REFERENCES

A. American Society of Testing Materials:
01 ASTM B117 – Practice for Operating Salt-Spray (Fog) Apparatus.
02 ASTM B221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
03 ASTM D822 – Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
04 ASTM D1654 – Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
05 ASTM D2244 – Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
06 ASTM D2794 – Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
07 ASTM D3359 – Test Method for Measuring Adhesion by Tape Test.
08 ASTM F1184 – Industrial & Commercial Horizontal Slide Gates.

1.5 SYSTEM DESCRIPTION

A. The manufacturer shall supply a total industrial ornamental aluminum cantilever gate system of the Ameristar® TransPort II design, (specify Classic, Majestic, Genesis, or Invincible) style. The system shall include all components (i.e., tracks, uprights, bracing, pickets, hardware, fittings and fasteners) required.

B. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. TransPort LINK gate system, without extended uprights style, manufactured by Ameristar Fence Products, Inc.

2.2 MATERIALS

A. The materials used for cantilever gate framing (i.e., uprights, diagonal braces and pickets or pales) shall be manufactured from ASTM B221 aluminum (designation 6063-T-6) with a yield strength of 25,000 PSI, a tensile strength of 30,000 PSI and a standard mill finish. The TransPort® Fast-Trak™ rails shall be manufactured from ASTM B221 aluminum (designation 6063-T-6) with minimum yield strength of 25,000 PSI, a tensile strength of 30,000 PSI and a standard mill finish.

B. Material for diagonal bracing and uprights shall be 2" sq. x ¼" aluminum. The design of the top and bottom enclosed track shall conform to the manufacturers 5" x 2" Fast-Trak system. Material for pickets shall be 1" x 1/8" wall aluminum.

C. Internal roller truck assembly shall be self-aligning swivel ball-and-socket type running on four bearing wheels. Internal roller truck assembly shall be affixed to the hanger bracket by means of a 5/8" diameter industrial-grade rod end/center bolt, with a minimum static load rating of 10,000 pounds. Attachment of the center bolt to the truck body shall be by means of a swivel joint to ensure equivalent and consistent loading on all bearing wheels and internal track surfaces throughout the travel of the gate.

2.3 FABRICATION

A. Pickets, enclosed track, uprights and diagonal bracing shall be pre-drilled and labeled for easy assembly. All components shall be precut to specified lengths.

B. Top and bottom rail extrusions shall be mechanically fastened to vertical uprights and reinforced with diagonal braces, as required by Drawing.

C. The manufactured components shall be subjected to the Ameristar thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color shall be (specify Black, Bronze, White, or Desert Sand). The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

Table 1 – Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).

Weathering Resistance	D822 D2244, D523 (60˚ Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

PART 3 – EXECUTION

3.1 PREPARATION

A. All new gate installations shall be laid out by the Contractor in accordance with the construction plans.

B. All hardware shall be installed in accordance with the Transport installation instructions. Transport cantilever gates shall be installed so they comply with current ASTM F2200 & UL325 standards.

C. Gate stops shall be installed on each track in a way that conforms to current ASTM F2200 standards.

3.2 GATE INSTALLATION

A. Gate post shall be spaced according to specified gate elevation. Posts shall be set in concrete footers having a minimum depth of 48” with a minimum diameter of 12”. The “Earthwork” and “Concrete” Sections of this Specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.3 CLEANING

A. The Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 - General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Provide chain link fencing in heights and at locations / configurations as indicated on the Drawings.
   02 Provide single and double chain link gates where indicated on the Drawings.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 32 13 13 – Concrete Paving
   03 Section 32 31 19 – Decorative Fences and Gates

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.

D. Site Plan Drawings:
   01 Site plan (and more detailed plan where necessary) showing layout of all proposed chain link fencing and gates.
   02 Indicate height, size, material, and finish.
   03 Include details of post anchoring / footings, joints, attachments and clearances of all components.

E. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

F. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

G. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

1.3 REFERENCES

A. American Society for Testing Materials:
   01 ASTM A90 – Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
   02 ASTM A153 / A153M-16 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   03 ASTM A653 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   04 ASTM A924 / A924M – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   05 ASTM F668 – Polyvinyl Chloride (PVC)-Coated Steel Chain Link Fence Fabric
   06 ASTM F900 – Standard Specification for Industrial and Commercial Swing Gates.
   07 ASTM F1043 – Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
   08 ASTM F1664 – Standard Specification for Polyvinyl Chloride (PVC)-Coated Steel Tension Wire Used with Chain Link-Fence.

B. Chain Link Fence Manufacturers Institute "Industrial Steel Specifications for Fence Posts, Gates and Accessories".

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain Link Fabric:
   01 Diamond mesh (2 inch), helically-woven and inter-woven.
   02 Class 2A – Extruded and bonded.
   03 Wire Size: Minimum 9-gauge copper bearing steel wire, hot dip galvanized. Gauge does not include PVC coating.
   04 Wire Tensile Strength: 70,000 PSI.
   05 Twisted and barbed (double knuckle) finished at top and bottom selvages (no exposed barbs).
   06 Attach chain link fabric with 9-gauge galvanized tie wire to all rails at 18" O.C. maximum intervals.

B. Framing:
   01 All pipe components shall be fabricated from Schedule 40 steel pipe; unless noted otherwise.
   02 All components shall be hot dip galvanized.
   03 All rails shall be located toward the inside of the site.

C. Fence Posts:
   01 Posts for fences 7’-0” or less:
      a. Line: 2-3/8” O.D.
      b. Terminal / End / Corner: 2-7/8” O.D.
   02 Posts for fences 7’-1” to 10’-0”:
      a. Line: 2-7/8” O.D.
      b. Terminal / End / Corner: 3-1/2” O.D.
   03 Line posts for fences 10’-1” or greater:
      a. Line: 2-7/8” O.D.
      b. Terminal / End / Corner: 4” O.D.
   04 Provide conical tops at all posts, firmly secured in place.

D. Top and Bottom Rail:
   01 Continuous top rail: 1-5/8” O.D. minimum.
   02 Continuous bottom rail: 1-5/8” O.D. minimum. Provide at all fences taller than 6’-0”.
   03 At fences without bottom rail, stretch minimum 9-gauge bottom tension wire taut between terminal posts. Securely anchor to each intermediate post 6 inches above grade and secure to fence fabric with hog rings at 24” O.C.

E. Mid Rails and Truss Braces:
   01 Continuous mid rail: 1-5/8” O.D. minimum. Provide at all fences 8’-0” tall or taller.
   02 Provide 5/16” truss rod and turnbuckle between terminal posts and adjacent posts.
   03 Where required for stability and rigidity, provide 1-5/8” O.D. diagonal truss members between terminal posts and line posts.

F. Tension Bars and Wire:
   01 Tension bars shall be minimum 5/8” flat bar. Connect chain link fabric to terminal posts with tension bands; 12” O.C. maximum spacing.

G. Swing Gates - ASTM F900:
   01 General: Gate frames shall be constructed of 2” round steel tubing of the sizes listed below.
   02 Person swing gates shall be joined at the corners by arc welding to form a rigid, one-piece unit and filled with specified chain link fabric to match the fence. Hot-dip galvanize after fabrication.
   03 Fasten fabric to the frame on all four sides by means of adjustable hook bolts and tension rods. Equip all gates with galvanized steel hinges and latch.
   04 Gate leaf width 3’-0” to 5’-0”: 2-1/4” O.D. 4.1 PLF, ASTM A120, galvanized schedule 50 pipe or 2-1/2 inch X 2-1/2 inch roll section, ASTM A501, hot dipped galvanized.
   05 Gate leaf width 8’-0” to 11’-0”: 4” O.D. 9.11 pounds per foot, ASTM A120, galvanized schedule 50 pipe or 3” x 3” roll section, ASTM A501.
   06 At double leaf gates, provide a crane bolt drop rod to secure one leaf. Provide a receiver in ground for drop rod. Imbed received in concrete minimum of 6" diameter by 12" deep. Provide a clip to secure the drop rod in the raised position when the leaf is open.

H. Swing Gate Hardware:
   01 Hinges: Provide male / female post type hinges.
      a. Two (2) per gate up to 72”.
      b. Three (3) hinges per gate 72” (+).
      c. Where designated, provide self-closing spring hinge(s).
   02 Standard Latches: Fork type latch capable of accepting (owner furnished) pad lock.
   03 Self-Closing Gate Latches: Provide self-latching latch capable of accepting (owner furnished) pad lock.

04 Double Leaf Gate Latches: Provide 2-piece, heavy duty double-fork latch with 6” legs and slotted receiver; capable of accepting (owner furnished) pad lock.

05 Crane Bolts / Drop Rods: At double leaf gates, provide a crane bolt drop rod to secure one leaf.

a. Provide a receiver in ground for drop rod. Imbed received in concrete minimum of 6" diameter by 12" deep.

b. Provide a clip to secure the drop rod in the raised position when the leaf is open.

I. Swing Gates with Exit Devices:

01 Coordinate with hardware supplier for exact requirements of gate components for proper interface with exit device.

02 Self-closing hinges capable of latching exit device.

03 Exit Device Housing: Provide minimum 6”H x 2-1/2” D x 1/4” steel plate C-shape section welded continuous to gate frame at each end.

04 Strike Plate: Provide minimum 1/4" thick steel plate on fixed fence section as required to mount exit devise strike receiver mechanism.

05 Where shown, provide minimum 12 gauge expanded metal sections welded to gate / fence components as required to prevent access to exit device controls.

J. Polyvinyl Chloride (PVC) Coating:

01 Chain link fabric and associated wiring to be Class 2b PVC, 22 mil coating per ASTM F668 and ASTM F1664.

02 Rails, posts and other non-wire components shall have a bonded PVC coating to give equivalent performance to chain link fabric, per ASTM F1043.

03 All none fabric components shall be finished with a minimum of 2 mils of epoxy paint per manufacturer’s standards.

04 Color: Black

K. Privacy Slats: Polyvinyl Chloride (PVC) Coating:

01 Provide privacy slats for all chain link fencing at the perimeter of the property. Slats to be full height of fence and width to fit fence fabric.

02 Material: Reinforced vinyl fence fabric.

03 Color: As selected by Owner from manufacturer’s full range of standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing:

01 Space line posts at 8'-0" O.C. maximum.

02 Space pull posts where grade changes more than 30-degree slope.

B. Footings:

01 Line Posts: Set in minimum 9” diameter concrete. Depth a minimum of 24 inches for a 4’ high fence, plus a 3” increase in depth for every 1” in height over 4’.

02 All terminal, corner, and pull posts: Set in minimum 12” diameter concrete footing a minimum of 36” inch post embedment in concrete, with a minimum 3” concrete cover at the bottom.

03 Concrete footing sizes and depths are based on holding top of footings +/- 4” below finish grade. Concrete exposed at finish grade shall not be accepted.

04 All concrete shall be 3,000 psi minimum (28 days), pea gravel aggregate.

05 Refer to Section 03 30 00 – Cast-In-Place Concrete for additional information and requirements.

C. Install all chain link fencing and gates in strict accordance with Chain Link Manufacturers Institute recommendations.
   01 Stretch fabric to proper tension between terminal posts and securely fasten to frame. Bottom of fabric shall be held as uniformly as practical to the finished grade.
   02 Fasten chain link fabric securely to terminal posts with 3/16” x 3/4” tension bars and 11-gauge tie wires, spacing not to exceed 14 inches apart.
   03 Tie fabric to rails with 9-gauge tie wires, spacing not to exceed 18” O.C.

D. Gates (Swing): Install plumb and level. Adjust hardware for smooth operation.

END OF SECTION

SECTION 32 31 19

DECORATIVE FENCES AND GATES

CONDITIONS OF THE CONTRACT, DIVISION 0 AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. Refer to Sections 00 – Procurement and Contracting Requirements and Sections 01 – General Requirements including 01 25 00 – Request for Substitution Procedures.

B. Scope of Work:
   01 Design, fabrication and installation of decorative steel fencing and gates.
   02 Refer to Drawings for fencing locations, and gate sizes and locations.
   03 Proved all materials and accessories required for a complete installation.
   04 Coordinate with other trades as required for proper interface with finish hardware, access control systems and other electrical systems.

C. Related Work:
   01 Section 03 30 00 – Cast-In-Place Concrete
   02 Section 05 50 00 – Metal Fabrication
   03 Section 32 31 13 – Chain Link Fencing and Gates

1.2 SUBMITTALS

A. Review and comply with all provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit manufacturer's literature, product data, certifications and supporting information for all products proposed to be furnished, as necessary to demonstrate compliance with the specified requirements.

C. Shop Drawings: Submit complete Shop Drawings consisting of design, fabrication and erection / installation of proposed assemblies.
   01 Show profiles, sizes, spacing and locations of assembled components.
   02 Show details of shop fabrications, connections and details.
   03 Show details of field fabrications, connections and details.
   04 Site Plan Drawings showing complete layout of fencing, including gates, post sizes and locations and interface with adjacent work.
   05 If electrically-controlled gates are included, provide detailed Drawings indicating sizes and locations of electrical / control interface and stub-up locations. Coordinate with electrical contractor as required.
   06 Provide details for post installation, component connections, gates and gate hardware.

D. Installation Instructions: Submit manufacturer's complete installation instructions, including fastening, for all products and / or assemblies proposed to be furnished.
   01 Installation details submitted for review shall be specific to the Work of this Contract and accurately depict interface within the assembly(s) indicated on the Drawings.
   02 Generic details that do not depict actual conditions shall not be acceptable.

E. Maintenance Instructions: Submit manufacturer's complete maintenance instructions and recommendations for all products and / or assemblies proposed to be furnished.
   01 Include recommended cleaning products and instructions for use.
   02 Where applicable, provide recommended maintenance schedules and procedures.

F. Color / Finish Samples:
   01 Provide two (2) samples of each finish for selection by the Architect.
   02 Finish samples shall be provided of / on actual material; paper or digital samples shall not be accepted.
   03 Minimum size shall be 3" x 3" but must be large enough to convey attributes of the proposed product.

G. For warranties longer than one (1) year, submit a sample of the warranty proposed to be furnished.

1.3 REFERENCES

A. ASTM International:
   01 ASTM A65 / A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
   02 ASTM B117 – Practice for Operating Salt-Spray (Fog) Apparatus.
   03 ASTM D523 – Test Method for Specular Gloss. 0020
   04 ASTM D714 – Test Method for Evaluating Degree of Blistering in Paint.
   05 ASTM D822 – Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
   06 ASTM D1654 – Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
   07 ASTM D2244 – Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
   08 ASTM D2794 – Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
   09 ASTM D3359 – Test Method for Measuring Adhesion by Tape Test.
   10 ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

B. Refer to Section 05 50 00 – Metal Fabrications for additional information and requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Design of ornamental fencing and gates is based on products manufactured by Ameristar.

B. Acceptable Manufacturers: The following manufacturers are acceptable to provide products of this Section, provide all proposed products meet or exceed the specified requirements.
   01 Ameristar
   02 Anchor Fence Co.
   03 Astro Fencing Co.
   04 Foster Fencing Co.
   05 Aber Fencing Co.
   06 Merchant Metals

2.2 GENERAL

A. Design of decorative fencing is based on Ameristar Montage Commercial 3-rail fencing.

B. Decorative fencing design, rail and picket configuration and height as indicated on the Drawings.
   01 Fence Height: 6’-0”.
   02 Maximum Post-To-Post Spacing: 8’-0”.

C. Design bottom of fence to be a maximum of 4” above pavement, concrete flatwork or finished grade as applicable.
   01 Refer to Civil Drawings for additional information.

D. Materials:
   01 Steel material for fence panels and posts shall conform to the requirements of ASTM A653 / A653M, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft^2. Coating Designation G-60.
   02 Posts shall be 2-1/2” square 14 gauge minimum; and larger where required for structural integrity of the fencing.
   03 Material for pickets shall be 3/4” square x 14 Ga. tubing.
   04 The rails shall be steel channel, 1.5” x 2” x 12 Ga.
   05 Picket holes in the rail shall be spaced 4.675” O.C. for standard picket space. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

E. After fabrication, materials shall be hot dipped galvanized per ASTM A653 and A90.

F. Fence / Gate Finish:
   01 The manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat.
   02 The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm).
   03 The color shall be Black.
   04 The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic criteria of ASTM F2408.
   05 For gates indicated to have exit devices, provide wire mesh on gate and both sides as required to prevent reach-through access to the exit device.

G. Gate Hardware:
   01 Provide heavy duty hinges at al gate leaves, minimum two (2) per gate.
   02 Hinges at gates indicated to have an exit device shall be spring loaded.
   03 Provide manufacturer’s standard latching system.
   04 Refer to section 08 71 00 Finish Hardware for specific hardware at each gate.
   05 Provide 1/2" minimum crane bolts / drop rods and keeper sleeve.
   06 Operator: Unless indicated otherwise, provide pad lockable butterfly latch system; operable form both sides.
   07 Where indicated by finish hardware set (Section 08 71 00 – Door Hardware), coordinate as required to prep gates to receive exit devices or other specified hardware.

2.3 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture.
   01 The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly.
   02 The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel.

C. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Commercial weight fences under ASTM F2408.

D. Gates:
   01 Gate posts shall be minimum 4" x 4" x 11 gauge.
   02 Gates with an out-to-out leaf dimension less than and including 72 inches shall be fabricated using Montage Commercial ornamental panel material and 1-3/4" sq. x 14ga. gate ends.
   03 Gate leafs greater than 72 inches shall be fabricated using ForeRunner rails, intermediate uprights, gussets and 1-3/4" sq. x 14ga. gate ends.
   04 All rail and upright intersections shall be joined by welding. Style 1: 1.5" x 2 x 12 ga. Min.
   05 All picket and rail intersections shall also be joined by welding. ¾" square, 14 ga minimum, 4"

E. Fencing shall be fabricated form components welded at all connections to form panels to be attached to posts set in the field.

F. Swing Gate Components:
   01 Fabricate gates using same components specified for general fencing.
   02 Gate Posts: 4" x 4" x 11 gauge minimum.
   03 Hinges: Heavy duty, 1/2" minimum j-bolt / steel sleeve with washer and nut to secure hinge. Provide 2 hinges on gates up to 72" and 3 hinges for gates taller than 72".
   04 Provide 1/2" minimum crane bolts / drop rods and keeper sleeve.
   05 Operator: Unless indicated otherwise, provide pad lockable butterfly latch system; operable form both sides.
   06 Where indicated by finish hardware set (Section 08 71 00 – Door Hardware), coordinate as required to prep gates to receive exit devices or other specified hardware.
   07 Provide other components and accessories required for a complete installation as recommended by the manufacturer.

G. Gate Interface with Hardware / Access Control:
   01 At gates to receive exit devices:
      a. Provide a minimum 8" x 12 gauge plate the width of the gate, centered on exit device, on the exterior side of the gate.
      b. Provide a 12 gauge C-shaped receiver for the exit device, full width of gate; depth as required to preclude opening from outside with use of a tool or rope.
      c. Within 36" of access exit device on gate and adjacent fencing, provide expanded metal or similar means to preclude reaching through fence and activating the exit device.
   02 Coordinate with other trades as required for proper interface of access control devices or other electrical hardware.
      a. Provide cut-outs and similar openings as required.

b. Provide means of gate / fence components being used as a wireway where required.

2.4 WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of Substantial Completion.
   01 Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of Substantial Completion.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   01 Complete installation in accordance with manufacturer's printed instructions and final reviewed submittals.
   02 Install all posts plum and properly aligned in straight fence runs.
   03 At radius or curved fence sections, install posts in segmented layout to create a smooth radius / curved appearance.
   04 Space line posts at 8’-0” O.C. maximum.

B. Footings:
   01 Line Posts: Set in minimum 12” diameter concrete footing a minimum of 24 inches, with a minimum 3” concrete cover at the bottom.
   02 All terminal, corner, and pull posts: Set in minimum 12” diameter concrete footing a minimum of 36 inch post embedment in concrete, with a minimum 3” concrete cover at the bottom.
   03 Concrete footing sizes and depths are based on holding top of footings +/- 4” below finish grade. Concrete exposed at finish grade shall not be accepted.
   04 All concrete shall be 3,000 psi minimum (28 days). Refer to Section 03 30 00 Cast-In-Place Concrete.

C. Fabricate and install fencing such that pickets will uniformly follow within 4” of grade and / or concrete work below the fence.
   01 Refer to Civil Drawings and grading plans for additional information.

D. Swing Gates:
   01 Install plumb and level.
   02 Adjust hardware for smooth operation.
   03 Coordinate with other trades for installation of finish hardware required to be installed.

E. Grind all field welds smooth; and touch-up with cold galvanizing coating and finish coats to match prefinished fence color.

F. Cycle all swing gates to assure proper installation of all hardware and smooth operation.

END OF SECTION

SECTION 32 84 00

LANDSCAPE IRRIGATION

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Refer to Section AB-Instructions to Proposers, Section AF – Subcontractor/Manufacturer Prequalification and Section 01 25 00 – Request for Substitution Precedures.

B. SCOPE OF WORK:
Work Included: Perform all work necessary and required for construction of the project as indicated. Such work includes but is not limited to the following:

1. Furnishing and installing a complete irrigation system; including meter, backflow preventer and cover, isolation valves, flow meter, master valve, electric valves, irrigation bodies, heads and nozzles, 2-wire, decoders, ground rods, controller with wifikit and rain sensor, sleeves and all related pipe and joints.

2. Contractor is responsible for all registrations, inspections, licenses, permits and fees to complete the irrigation system.

3. Furnish and install controller and rain sensor.

4. Furnish and install backflow prevention device, insulation and protective cover.

5. Furnishing and installing schedule 40 P.V.C. sleeves.

6. Sprinkler lines shown on the drawings are diagrammatic. Existing conditions may require minor adjustments.

7. Coordination with electrical power and related equipment for controller power circuit breaker.

8. Coordinate controller connection and verify proper connection

C. Related Work in Other Sections but not limited to:

1. Examine all sections for work related to this section.

1.02 QUALITY ASSURANCE

A. Contractor to attend a pre-installation meeting and participate in installation meetings with Owner's Representative.
B. Contractor shall continuously maintain a competent superintendent, satisfactory to the District with the authority to act for him in all matters pertaining to the work and in compliance with supervisory rules established by TCEQ.
C. The Contractor shall have a minimum of 5 years experience installing irrigation systems of comparable size, specialty and complexity and have suitable financial means to meet the responsibilities and obligations of this project.

1.03 SUBMITTALS

A. At minimum of 14 days prior to beginning work, submit for approval items from the materials list and plan legend; including manufacturer's catalog cuts and specifications. Operation manuals not needed.

B. At a minimum include, valves of all types, sprinklers, swing joints, nozzles, controller, rain sensor, wire and wire connectors, pipe, fittings, valve boxes, glues and primer, etc. Items listed on plan legend and specification materials section. Quantities of materials and equipment need not be included.

C. Name and Irrigation License number for irrigation Contractor.

1.04 INSPECTION OF CONDITIONS

Examine related work and surfaces before starting work of this Section. Report to the Landscape Architect, in writing, conditions which will prevent the proper provision of this work. Beginning the work of this Section without reporting unsuitable conditions to the Landscape Architect constitutes acceptance of conditions by the Contractor. Any required removal, repair, or replacement of this work caused by unsuitable conditions to be done at no additional cost by Owner.

1.05 "AS-BUILT" IRRIGATION DRAWINGS

A. Contractor shall furnish Record Drawings of the complete irrigation system in accordance with the General and Special Conditions. Construction Drawings shall be on the construction site at all times while the irrigation system is being installed. Contractor shall make a daily record of all work installed during each day.

B. The drawings shall be to scale and show actual location of valves and all irrigation piping and shall be shown on the prints by dimensions from easily identified permanent features, such as buildings, curbs, fences, walks or property lines. Drawings shall show approved substitutions, if any, of material including manufacturer's name and catalogue number. All information noted on the print shall be transferred to the plan by Contractor and all indications shall be recorded in a neat, orderly way. The record plan shall be turned over to the Owner at or before the Final Acceptance of the project and as part of the close-out documents.

1.06 CODES, RULES AND SAFETY ORDERS AND STANDARDS

A. All work and materials to be in full accordance with latest rules and regulations of safety orders of the Division of Industrial Safety; the Uniform Plumbing Code published by the Western Plumbing Officials' Association; and other applicable laws of regulations, including Harris County and the City Of Houston Plumbing Code and TCEQ. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes. Should the Construction Documents, or instructions, be at odds with the aforementioned rules and regulations, notify Landscape Architect and get instructions before proceeding with the work.

B. Furnish and maintain all warning signs, shoring, barricades, red lanterns, etc., as required by the Safety Orders of the Division of Industrial and local ordinances.

C. Requirements of GENERAL CONDITIONS, and DIVISION NO. 1 apply to all work in this section.

1. Published specifications, standards, tests or recommended methods of trade, industry, or governmental organizations apply to work of this section where cited abbreviations noted below.

American Society of Testing Materials (ASTM).

1.07 INTENT OF THE DRAWINGS

A. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, civil structures and architectural features.

B. The word Architect or Engineer as used herein shall refer to the Owner's authorized representative or the Landscape Architect.

C. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

D. Existing trees to remain are indicated on drawings. Irrigation lines are diagrammatic and drawn for clarity. Avoid existing trees to main with trenching and then only when unavoidable, hand trench within the drip line of all existing trees to remain.

E. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Owner's authorized representative. In the event this notification is not performed, the irrigation contractor shall assume full responsibility for any revisions necessary.

1.08 PERMITS AND FEES

A. Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Arrange inspections required by local agencies and ordinances during the course of construction as required.

B. Contractor is responsible for all registrations, inspections, licenses, permits and fees to complete the irrigation system.

C. Failure to obtain reviews may require contractor to re-excavate system at his expense.

1.09 SUBSTITUTIONS

A. No substitutions without written approval of the Landscape Architect prior to bidding.

B. Installation of any approved substitution is Contractor’s responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of Landscape Architect and without additional cost to Owner. Any substitution of materials shall be submitted two days prior to bid date in writing, complete with spec sheets to Landscape Architect.

C. Approval by Landscape Architect of substituted equipment and /or dimensional drawings does not waive these requirements.

1.10 PROTECTION OF EXISTING CONDITIONS

A. Contractor shall acquaint himself with all site conditions. Should utilities or other work not shown on the plans be found during excavations, Contractor shall promptly notify Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.

B. Contractor shall take necessary precautions to protect site conditions and plants to remain. Should damage be incurred this Contractor shall repair damage to its original condition or furnish and install equal replacement at his expense.

1.11 COORDINATION

A. Coordinate and cooperate with other Contractors to enable the work to proceed as rapidly and efficiently as possible.

1.12 PRODUCT HANDLING, DELIVERY AND STORAGE

A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
B. Deliver plastic pipe in bundles, packaged to provide adequate protection of pipe ends either threaded, bell or plain.
C. Store and handle material to prevent damage and deterioration.
D. Protect work and materials under this Section from damage during construction and storage. Protect polyvinyl chloride (PVC) pipe and fittings from direct sunlight. Do not use any pipe or fitting that has been damaged or dented.

1.13 INSPECTION

A. Submit written requests for inspection to Landscape Architect at least 3 days prior to anticipated inspection.
B. Preliminary review of completed installation will be made by Landscape Architect prior to back filling of trenches and during hydrostatic testing.
C. Work may be periodically observed throughout installation. Impromptu reviews may occur at any time during the project.
D. Final review shall be made in conjunction with the final review of lawn, shrub and tree planting.

PART 2 – MATERIALS

2.01 GENERAL

A. Materials throughout the system shall be new and in perfect condition and the best of their kind and class. Any material overages at the completion of the installation are the property of the Contractor and are to be removed from the site.
B. Each major component of equipment shall have the manufacturer's name and serial number permanently attached .
C. The same manufacturer shall be used for each specific application of valves, fittings, heads, etc.
D. All equipment shall be listed approved or rated by a nationally recognized testing and rating bureau of recognized manufacturer's association responsible for setting industry standards. All electrical equipment shall be U.L. listed.

2.02 SLEEVING

A. Install sleeves beneath paved areas for irrigation pipe and wiring bundle.
B. All sleeving to be Sch 40 pipe –4" or 6". See plan for each location. If size is missing, default is 6".
C. Sleeving diameter: See plan for sizes. Minimum wire sleeve size to be 2" unless indicated otherwise.

D. All pipe in sleeve to be glued.

2.03 WATER METER

A. New irrigation meter to be installed. Coordinate with MUD District or City or County for their preferred irrigation meter and for installation.

2.04 BACKFLOW PREVENTION ASSEMBLY with Protective Cage

A. Install as shown on drawings and details.
B. Locations shown on drawings.

2.05 PIPE

A. All piping mainline and laterals:
   1. Schedule 40 and shall conform to ASTM D 1784 and D2466.
   2. Use solvent weld pipe.
B. Bell ended type pipe preferred.
C. Identification: All piping shall be continuously and permanently marked with the following:

   1. Manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation approval.

D. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles and dents.
E. Pipe sizes referenced in the construction documents are minimum sizes and may be increased at the option of the Contractor at no cost to the Owner.
F. All pipe damaged or rejected because of defects shall be removed from the site at the time of rejection.

2.06 FITTINGS

A. Assemblies calling for threaded pipe connections shall use PVC Schedule 80 nipples and PVC
Schedule 40 threaded fittings.
   1. Fittings for Solvent Welded Pipe shall be Schedule 40, polyvinyl chloride, standard weight, as manufactured by Sloane, Lasco, or approved equal, to meet ASTM D 2466-73 and D 2467-73.
B. Use only Teflon type tape on plastic threads.
C. Minimum of 18" of pipe between zone valves and next fittings on either side of zone valves.
D. Use standard Schedule 40 PVC fittings to meet ASTM 2466.
E. Female fittings are not allowed.

2.07 THRUST BLOCKS -NA

A. Use thrust blocks for fitting on pipe utilizing rubber gasket pipe or 3" dia PVC and larger.
B. Use 3,000 PSI concrete
C. Use 2-mil plastic to encapsulate the fitting or valve.
D. Size thrust blocks per piping manufacturer's recommendations for pipe size and soil type

2.08 ISOLATION VALVES

A. NIBCO bronze ball valve, threaded, two-piece, full port, bronze trim, blowout-proof stem. T-585-70-SSHN (1/2"-2") and T-580-70-SSHN (2 ½" – 3")
B. Install in a separate rectangular valve box.

2.09 ELECTRIC ZONE CONTROL VALVES

A. All parts shall be serviceable without removing valve from line. A minimum of 18" of pipes between zone valve and the next fitting on either side of zone valve.
B. Valve shall be held normally closed by internal pressure with manual bleed screw.
C. Remote control valves as shown on drawing legend and details.
D. Valve markers / id tags to be used. Write zone location number for each zone valve on inside of box cover lid with permanent marker.

2.10 MASTER VALVE / FLOW SENSOR

A. As indicated in Legend.
B. Supply 10' of pipe on each side of master valve/flow sensor to any turn, zone valve or meter.

2.11 IRRIGATION CONTROLLERS with wifikit & RAIN SENSOR

A. As shown on drawing legend and details.
B. The rain sensor shall be mounted in a location that will be vandal resistant and is able to gather the necessary data without interference. Coordinate with Owner and Project Manager and District prior to mounting.

2.12 CONTROL WIRE

A. Wire: Use American Wire Gauge (AWG). Solid copper wire, U.L. approved for direct burial in ground. Minimum gauge: #14. #12 UF for runs over 1000 lf. Common ground wire shall be white.
B. 2 wire system, twisted pair jacketed 14 gauge, type UF with plastic insulation, solid copper and 600 volt rated for direct burial applications.
C. Splicing Materials: 3M-DBR/Y-6 wire connector with waterproof sealant. Wire connector to be of plastic construction.
D. Color: Each wire color shall be continuous over its entire length.
E. Wire markers: pre-numbered or labeled with indelible non-fading ink made of permanent non-fading material.
F. 120 volt power supply for controller shall be furnished to controller location by the Electrical Contractor.

2.13 POWER WIRE

A. Electric wire from the power source to the controller shall be solid or stranded copper. Type UF single conductor cable, UL approved for direct underground burial. Power wires shall be black, white and green in color.
B. Conduit: PVC Sch 80
C. Splices: Use approved connectors.
D. Follow all local and state codes.

2.14 VALVE BOXES

A. For Valves :

1. Electric and Isolation valves: Valve boxes shall be heavy duty plastic 17 inch by 11-3/4 inch by 12 inch depth, black with black or green cover. Valve box shall be heavy duty Professional Series, non-hinged, non-bolt cover, by Rain Bird.

2. Quick coupler valves: Valve boxes shall be heavy duty plastic 17 inch by 11-3/4 inch by 12 inch depth, black or purple base with purple cover. Valve box shall be heavy duty Professional Series, non-hinged, non-bolt cover, by Rain Bird.

B. Wire splice boxes; Drip flush and Air release:

1. Boxes shall be heavy duty plastic 10 inch diameter by 10-1/4 inch deep, black with black or green cover, by Carson Industries, Inc. or Rain Bird.

2.15 SWING JOINTS

A. Swing joint shall be 4 fitting swivel ells on both ends; 6" and 12" lengths with ½" and ¾" threads and pressure rated to 150PSI with a 2 yr warranty by Hunter or approved equal.

2.16 SPRINKLER HEADS

A. Sprinkler heads mounted on pre-assembled swing joints.
B. Contractor to provide Owner with two extra sprinkler heads and nozzles of each type specified and used.
C. Heads to be shown in drawing legend and details.

2.17 DRIPPER TUBING and ASSEMBLY

A. Operation Indicator – pop-up head
B. Tubing – to be a manufactured product as specified per legend
C. Dripper Control Zone valve with air relief – per legend & details

2.18 BACKFILL

Provide imported sand for backfill to complete work. Sand shall be clean sand free of stones or debris. Sand placed a minimum of 6" inches directly around pipe in trench.

2.19 GLUE

A two step process, use primer and solvent cement to conform to ASTM Standard D2564. Christy's purple primer and medium duty pipe cement (Oatey or Weld-on 705 or equivalent) to be used on all pipe joints. (Red hot blue glue is not allowed)

PART 3 – EXECUTION

3.01 INSPECTION AND REVIEWS

A. Site

Verify construction site conditions and note irregularities affecting work of this section. It shall be the contracting installer's responsibility to report to the Owner's authorized representative any deviations between drawings, specifications and the site. Failure to do before the installing of equipment and resulting replacing and/or relocation of equipment shall be done at the Contractors expense.

B. Utility Locations

1. The exact location of all existing utilities and structures and underground utilities are not indicated on the drawings. Their locations shall be determined by the Contractor; by utility marking services and consulting Civil, Architectural and MEP plans as required.
2. Arrange for and coordinate with local authorities the location of all underground utilities.
3. Repair any underground utilities damaged during construction. Make repairs at no additional expense to the Owner.
4. The Contractor shall protect existing structures, plants, trees, utility services and be responsible for their replacement if damaged.

C. Pre-Construction Meeting
   1. During the Pre-Con meeting, Contractor will call attention to any issues he's discovered.
   2. The Owner and his representatives shall address questions so all parties are aware of issues, solutions and coordination involving other trades.

3.02 LAYOUT

A. Layout work as accurately as possible to drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown.
B. Install all mainline pipe and components inside of property lines.
C. Full and complete coverage is required. Contractor shall make any necessary minor adjustments to layout required to achieve full coverage of irrigated areas at no additional cost to Owner.
D. Where connections to existing stubouts are required, make necessary adjustments in layout to connect should stubs not be located exactly as shown. Adjust layout as necessary to install around existing work.
E. Where piping is shown to be under paved areas but running parallel and adjacent to planting area, intention is to install piping in planted areas.
F. It shall be the Contractor's responsibility to establish the location of all sprinkler heads on all turf areas in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted but substitutions of larger sizes may be approved. All pipe damage or rejected because of defects shall be removed from the site at the time of said rejection.

3.03 EXCAVATING AND TRENCHING

A. Perform all excavations as required to installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installation, etc., damaged of cut as a result of the excavations, to their original condition.
B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the Record Drawings promptly.
C. Trenches shall be of sufficient depth to provide minimum cover from finish grade as follows:

   1. Over PVC pipe on pressure side of irrigation control valve, control wires and quick-coupling valves: 18 in.

   2. Over pipe on non-pressure side of irrigation control valve: 12 in.

   3. Over control wire (in conduit): 10 in.-12in. unless local or state requirements dictate a deeper burial depth.

   4. All PVC pipe under paving shall be bedded with minimum of 6 in. of sand backfill on all sides and have 24 in. cover.

D. Backfill only after lines have been reviewed.

3.04 BORING UNDER EXISTING PAVEMENTS

A. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation shall be as described under "Excavation and Trenching." The location of the pit shall not interfere with existing plant materials or structures to remain.

B. Holes shall be bored mechanically. Where holes required are larger than two inches, the bore shall be completed using a pilot hole. The two inch hole shall be bored the entire length of the crossing and shall be checked on the opposite end for line and grade. If acceptable, this hole shall serve as the centerline for the larger hole to be bored. Lateral and vertical tolerance is limited to one inch in ten feet, provided that the variation be regular and occur in only one direction.

C. The use of water or other fluids in connection with the boring operation will be permitted only to lubricate cutting. Jetting shall not be permitted. (In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10% of high-grade processed bentonite may be used to consolidate cuttings, seal the hole walls and furnish lubrication for subsequent removal of cuttings and installation of the pipe.

D. Excavation material will be placed near the top of the working pit and disposed of as required.

3.05 WATER METER INSTALLATION

A. See civil for water tap area. New irrigation dedicated meter installed per city, MUD, or county regulations.

3.06 BACKFLOW PREVENTION DEVICE INSTALLATION

A. Install according to local code, TCEQ and manufacturer's instructions with HotBox insulated fiberglass cover with concrete base per details.

B. Secure upright pipes so unit does not wiggle.

C. Isolation valve to be installed no more than 48" from BFP.

D. Insulate backflow preventer

3.07 CONDUITS AND SLEEVES

A. Furnish and install conduit where control wires pass under or through walls. Conduits to be of adequate size to accommodate retrieval for repair of wiring and shall extend 12 in. beyond edge of walls.

B. Install sleeves for all pipes passing through of under walls and as shown on drawings. Install sleeves under walks, paving, etc. as required to facilitate a smooth construction sequence. Mark sleeve locations with a large X in wet concrete or mark with a grinder in dry concrete. Sleeving to be 4" or 6" and shall extend 12" beyond edge of paving or other construction.

C. Where sleeves are installed across driveways, backfill with stabilized concrete sand to within 1'0" of subgrade.

D. Coordinate conduit and sleeve installation with other trades as required.

3.08 PIPE LINE ASSEMBLY

A. Install pipe in accordance with manufacturer's instructions.

B. Maximum 3 pipes per trench.

C. For mainline, no 90° intersections. Use 45° intersections on mainline.

D. Clean all pipes and fittings of dirt, scales and moisture before assembly. Bevel all pipe cuts.

E. All pipe, fittings and valves, etc., shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be capped.

F. All lateral connections to the mainline as well as all other connections shall be made to the side of the mainline pipe. No connections to the top of the line shall be allowed.

G. Solvent weld PVC pipe and fittings using solvents and methods recommended by manufacturer. Clean pipe and fittings of dirt and moisture before assembly. Use a primer and solvent cement. PVC pipe may be assembled on ground surface beside bottom to allow for expansion and contraction. Make all connections between PVC pipe and metal valves or pipe with threaded fittings using PVC male adapters. Cure joint a minimum of one hour before

applying any external stress on the piping and at least twenty-four hours before placing the joint under water pressure.

H. Threaded pipe shall be factory formed threads. Use Teflon tape on threaded PVC fittings.

I. Laying of pipe:

1. Pipes shall be bedded in at least 6” inches of bank sand prior to backfilling trench with native earth; standard trench width, 2” sand bed at bottom of trench, irrigation pipe, 4” sand on top of pipe, then native backfill.

2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.

3. Do not lay PVC pipe when there is water in the trench.

4. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.

5. Plastic pipe shall be cut with PVC pipe cutter or hacksaw, or in a manner so as to ensure a square cut. Bevel ends so that smooth unobstructed flow will be obtained.

6. All plastic to plastic joints shall be solvent-weld joints or slip seal joints. Only the solvent recommended by the pipe manufacturer shall be used. All plastic pipe fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor’s responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.

J. Install thrust blocks on the mainline pipe work in accordance with pipe manufacturer’s written instructions for mainline pipe sized 3” and larger. Use cast in place concrete bearing against undisturbed soil. Wrap fitting with plastic to protect joint and fitting from concrete.

3.09 ISOLATION VALVES

A. Install in valve box. Box lid to be flush with finish grade. Valve shall be at mainline depth with brick supports and gravel base.

B. Follow manufacturer’s recommendations for installation.

3.10 IRRIGATION CONTROL VALVES

A. Flush mainline before installation of electric valve.

B. Install control valves in valve boxes. Place no closer than 12 in. to walk edges, buildings and walls. Valve box lids shall be flush with finish grade.

C. Leave 18” of pipe from valve to the nearest fitting on both sides of valve.

D. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wire. Install connectors and sealant per manufacturer’s recommendations.

E. One valve per box. Allow at least 12 inches between valve boxes.

F. Attach ID tag with controller station number to control wiring. Write zone location number for each zone valve decoder on inside of box cover lid with permanent marker.

3.11 SPRINKLER HEADS

A. Flush lateral lines before installing sprinkler heads.

B. Shrubs, lawn and rotary heads shall be set plumb, with top of head no more than ½ inch above

proposed finish grade.

C. Install proper nozzle model from series to obtain the pattern and coverage required as recommended by the manufacturer and to irrigate areas indicated on the drawings.
D. Locate sprinkler head 3” inches off adjacent pavement, fences, walls or building.
E. Extra Parts:
   1. Provide 2 extra heads of each size and type used.
   2. Provide 2 wrenches for each type of head core and 2 for removing and installing each type of head.

3.12 QUICK COUPLING VALVES

A. Quick coupling valves to be installed on a swing joint assembly.
B. Installed with in-line PVC ball valve per TCEQ requirements and details.
C. Purple valve box lid for this assembly.

3.13 AUTOMATIC CONTROLLER

A. Location of controller is approximate. Consult with Owner’s representative for exact location of controller and rain sensor.
B. Attach wire markers to the ends of the control wires inside the controller unit housing. Label wires with the ID numbers of the remote control valve to which the control wire corresponds.
C. Install per local code and manufacturer’s instructions.
D. Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
E. Affix controller name (i.e., “Controller A”) on inside of controller cabinet door with letters minimum of 1 in. high. Affix a nonfading copy of irrigation diagram to cabinet door or below controller door. Irrigation diagram to be laminated. (Irrigation diagram shall be a reduced copy of the as-built drawing and shall show clearly all valves operated by the controller, showing station number, valve size and type of planting irrigated.)

3.14 CONTROL WIRING

A. Install control wires with sprinkler mains and laterals in common trenches wherever possible. Lay to the side of pipeline. Provide looped slack at valves and snake wires in trench to allow for contraction of wires. Tie wires in bundles at 20 ft. intervals.
B. Control wire splices at remote control valves to be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than 500 ft. Line splices to be taped and sealed with sealer. Place in separate valve box.
C. Provide a 24” inch excess length of wire in an 8” inch diameter loop at each to degree change of direction and at 100’ foot intervals along continuous runs of wiring.

3.15 CLOSING OF PIPE AND FLUSHING OF LINES

A. Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
B. Thoroughly flush out all water lines before installing heads, valves or other hydrants.
C. Test as specified.
D. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution.
E. All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas shall be set to grade. Sprinkler heads which are to be installed in lawn areas where the turf has not yet been established shall be

set 1/2 inch above the proposed finish grade. Heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable destruction. Such lowering of heads shall be done by this Contractor with no additional cost to the Owner.

3.16 TESTING

A. Make hydrostatic tests when welded PVC joints have cured as per manufacturer's instructions.

1. Pressurized Mains:
   a. Completely install water meter mains, isolation valves and control valves. Do now install laterals.
   b. Open all isolation valves
   c. Fill lines with water and shut off meter
   d. Pressurize the main with air to 70 psi. Monitor gauge for pressure loss for four hours. Maximum pressure loss shall be 3 psi in four hours.
   e. Leave lines and fittings exposed throughout testing period.
   f. Leaks resulting from tests shall be repaired and tests repeated until the system passes.
   g. Test all isolation valves for leakage.

2. Non-pressure Laterals:
   a. Test piping after laterals and risers are installed and system is fully operational by visual methods.
   b. Leave trenches open to detect possible leaks.

B. Submit written requests for inspections to the Landscape Architect at least 48 hours prior to anticipated inspection date.
C. Document testing with video or photos.

3.17 BACKFILL AND COMPACTING

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil, free of debris.
B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum ninety-five percent density under pavements, eighty-five percent under planted areas.
C. Compact trenches by thoroughly flooding the backfill in lifts.
D. Dress off all areas to finish grades.

3.18 BALANCING AND ADJUSTING

A. Adjust heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering or raising of heads shall be part of the original contract with no additional costs to the Owner.
B. Adjust sprinkler heads for proper distribution and trim spray so it does not fall on building, walks or drives.
C. Adjust watering time of zones to provide proper amounts of water to all plants.

3.19 CLEAN-UP

Clean up and remove all debris, temporary sleeve markers, flagging, etc. from entire work area prior to Inspections to the satisfaction of the Owner's Representative.

3.20 INSPECTION AND ACCEPTANCE

A. Irrigation system shall have observation prior to cover-up by PISD Construction Department, PISD Maintenance Department, and/or Landscape Architect.
B. Work under this Section will be accepted by the Owner's Representative upon satisfactory completion of all work and "punch list" items generated by Substantial Completion review, but exclusive of contractor obligations under warranty.
C. Acceptance will include a 2 hour Owner orientation session with the contractor and owner/operator.
D. Contractor to provide a seasonal maintenance written instructions to the Owner.
E. Contractor to provide a reduced size, laminated zone map at controller.
F. Contractor shall provide Record Drawings / As-builts showing accurate and altered field locations.
G. Provide a copy of the backflow preventer test as performed by a licensed irrigation technician.

3.21 INSTALLATION MAINTENANCE

A. Contractor shall maintain the entire limit of landscape work during the course of landscape installation leading up to and including satisfactory completion of the Substantial Completion Review punch list.
B. Installation maintenance shall begin immediately after irrigation and planting is installed and continue until all Substantial Completion punch list items are completed. Installation maintenance includes all watering operations (permanent irrigation, temporary irrigation and hand watering).
C. Temporary above ground irrigation will probably be required to get hydromulch growing which is a requirement of the City of Pasadena.
D. Installation maintenance shall include watering, monitoring, adjustments to watering schedule, head and/or nozzle adjustments and/or repairs and replacements.

3.22 OWNER RESPONSIBILITY

Owner shall take responsibility of the landscape areas by maintaining, monitoring and repairing as needed the irrigation system to ensure the irrigation system remains in working order. Owner shall also fertilize, mow and maintain the landscape in a healthy condition with best practices and industry standards for landscape maintenance.

3.23 WARRANTY AND REPLACEMENTS

A. In addition to the manufacturer's guarantees or warranties, all work shall be warranted for one year from the date of Final Acceptance against defects in material, equipment and workmanship to the satisfaction of the Owner.
B. Contractor's responsibility to ensure and guarantee satisfactory operation of the entire system and the workmanship and restoration of the area.
C. During the one year period, Contractor shall fill and repair trench line depressions more than one inch. And repair landscape or structural features damaged by the settlement of irrigation trenches and excavation.
D. Make the repairs within 7 days of notification.
E. Any replacements shall be identical to the specified items in the Contract Documents. Repairs/replacements at no additional cost to Owner.
F. Contractor shall not be held responsible for failure/damage due to vandalism, storms, etc. during the Warranty Period. Document and report such conditions to the Owner.

END OF SECTION 32 84 00

SECTION 32 90 00

LANDSCAPE PLANTING

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION

PART 1 - GENERAL

1.01 **DESCRIPTION**

A. Refer to Section AB-Instruction to Proposers, Section AF – Subcontractor/Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work

1. Scope of work under this Section of the specifications shall include all approved materials, labor, equipment, transportation and services required and incidental thereto, in conformity with the plans and specifications, including but not limited to fine grading, prepared soil mix, supply and planting of trees, shrubs, groundcovers, grass and fertilizing, maintenance, clean-up, plant guarantee and replacement and other work related thereto.
2. Protection of existing features. During construction, protect all existing trees and specified vegetation, site features and improvements, structures and utilities as specified on drawings and/or in specifications.
3. Tree stake removal at the 11 month review

1.02 REFERENCE STANDARDS

A. American Joint Committee on Horticultural Nomenclature Standardized Plant Names
B. Texas Association of Nurserymen, Grades and Standards for Nursery Stock.
C. American Standard for Nursery Stock
D. ANSI A300 and Z60.1

1.03 QUALITY ASSURANCE

A. Installation of planting shall be performed by a single company specializing in landscape work. Contractor shall be licensed by the Texas Association of Nurserymen and shall possess an agricultural certificate and licensed pest applicator. Contractor shall have not less than 5 years of experience in this type of work.
B. Contractor to attend a pre-installation meeting and participate in installation meetings with Project Manager.

1.04 SUBSTITUTIONS

Substitutions must be submitted 10 days before proposals are due, if accepted, an Addendum will be issued, otherwise no substitutions are allowed. See Architect for any other requirements.

1.05 SUBMITTALS

Provide the following:

A. Product data and source for all items listed in Materials.
B. Material samples for planting mix, mulch and fertilizer. Samples shall be packaged in plastic bags and shall be typical of the material to be delivered to the site.
C. Color photos of plant material with gallon size indicated, height pole/scale rod (as needed) and plant name with grower and/or nursery name provided.
D. List the Landscape Contractor responsible for the work on this project.
E. Landscape Architect reserves the right to request purchase and delivery tickets when needed to verify correct variety or material for the project and to reject plant material on site.

1.06 UTILITY VERIFICATION

A. The contractor is responsible for contacting local utility companies for underground line location and verification. If underground lines interfere with planting then Landscape Architect shall be notified to make revisions prior to planting at no additional cost to the owner.

B. The contractor shall be responsible for all damages resulting from failure to comply with this requirement.

PART 2 - MATERIALS

2.01 MATERIAL delivery may begin upon approval of samples or as directed.

A. Topsoil: Contractor responsible for adding topsoil. Existing soil or borrow soil shall be natural, friable, fertile soil possessing characteristics of the local area. Existing topsoil is defined as the total amount of soil stripped in the top 4" inches less the vegetative layer. Soil to be free of subsoil, stones, clay, clod, sticks and roots. Topsoil containing nut grass or dallis grass will be rejected. See TOPSOIL specifications for requirements.

B. Mixed soil: If pre-mixed soil is used, an acceptable product is 'Landscaper Mix' by Nature's Way Resources or approved equal.

C. Compost: Compost as manufactured by Nature's Way Resources, Inc. or approved equal. Major nutrients: Nitrogen, Phosphorus, Potassium. Secondary: Calcium, Magnesium, Sulfur. Micronutrients: Iron, Manganese, Zinc, Copper. Materials to be commercially prepared fully composted under sustained temperatures to 165 degrees with a PH averaging 6.5 to 7.0.

D. Commercial Fertilizer: MicroLife 6-2-4 All organic, biological fertilizer as available at San Jacinto Environmental Supplies.

E. Mulch: Landscape finish mulch shall be imported, dark brown in color, shredded hardwood bark used for top dressing and shall have a particle size that passes 100% through a one inch thick square mesh and is retained on a 1/8" square mesh.

F. Sand: shall be sharp white sand (not bank sand).

G. Staking material:
1. Landscape fiber strap. ArborTie webbing green in color or equivalent.
2. Stakes shall be sound lodge poles not less than 7 ft. long, and 2" dia. and pointed at one end. Wood to be treated pine or hardwood.
3. Three stakes per tree (45 gallon and larger).
4. Two stakes per tree (30 gallon and smaller).

H. Post-emergent herbicide: Mirimichi Weed & Grass Killer available at San Jacinto Environmental Supplies in Houston, Texas

I. Pre-emergent herbicide: Barricade granular pre-emergent herbicide or approved equal applied to planting beds.

J. Weed Barrier: Pro-5 Weed Barrier 5 oz., woven, needle punched, geotextile polypropylene fabric. Available at San Jacinto Environmental Supplies 2221 West 34th St Houston, Texas

2.02 PLANTS

A. Quality: plants shall be No. 1 grade and true to species, commercial nursery grown in accordance with good horticultural practices under similar climatic conditions similar to those of the project site. They shall be fresh, vigorous, of normal growth, free of disease, insects, insect eggs and larva, and have strong root systems. Plant material shall be symmetrical or

typical for variety and species and conform to measurements specified in Plant List. **No root bound plant material shall be accepted.**

B. Size: all plants shall equal or exceed the measurements stated in the plant list. Plants shall be measured when branches are in their normal positions. If larger plants are used, then the root ball shall be increased in proportion to the size of the plant.
   1. Caliper measurements shall be taken 6 inches above the natural ground line for trees up to and including 4 inches in caliper and measured 12 inches above the natural ground for trees over 4 inches in caliper.

C. Selection: plants shall be subject to inspection and approval by the Owner at their place of growth and upon delivery for conformation to specification requirements. Such approval shall not impair the right of inspection and rejection during progress of the work.
   1. Trees with multiple leaders, unless specified, will be rejected. Trees with damaged bark, abrasions, crooked leaders, sunscald, disfiguring knots, pruned limbs over ¾" in diameter that are not completely healed will be rejected.

D. Contractor Responsibility: all questions regarding plant material selection, size and specifications will be directed to the Owner's Representative prior to submission of bids. Submission of bids will be understood that the Contractor fully understands the plans and specifications; that all plants and materials will be available in size, character and number at the time of installation. No substitutions will be allowed after bids are received.
   1. The plant list on the drawing is for the contractor's information only and is not guaranteed that quantities therein are correct. The contractor shall be responsible for providing the correct quantities and installation at the correct spacing.

2.03 PLANTING PREPARATION

A. Rock, underground construction work, tree roots or obstructions encountered in the excavation of tree or shrub pits shall be brought to the attention of the Landscape Architect. Proceed with work after alternate locations have been designated by the Landscape Architect.

B. Layout plants and trees in locations shown on drawings. Use color coded wire and wood stakes. Stake location of each tree and major shrub and outline of shrub and groundcover beds for approval by Landscape Architect.

C. Apply Mirimichi for existing weed elimination in lawn and planting areas prior to bed prep or planting.

D. All planting beds to be constructed with final grade and mulch below building weep holes. Under no circumstances shall the building weeps be covered. Contractor to bring all related concerns to the Project Manager prior to installation.

PART 3 - EXECUTION

3.01 WORK PROCEDURE

A. Planting Mix for all root zones: all tree, shrub and groundcover areas shall be backfilled with a prepared planting mix as follows: 25% parent soil, 25% topsoil, 25% compost, 25% sand (not bank sand).

B. Excavation for container trees shall be twice the width of the container (with angled sides), natural ground shelf and the depth shall keep the root flare and ball 1"-2" above grade (see detail).

1. After tree pit excavation, fill hole 2/3 full with water. Water must be absorbed before tree planting. If water is not absorbed within 24 hrs of flooding, let Landscape Architect know. A tree de-watering sump detail will be provided for tree pits holding water.
2. Ground shelf lift must be in place before tree planting.

C. Excavation for shrub pits shall be the width of the container + 18" and the depth shall keep the root ball 1”-2” above grade (see detail).

D. Excavation for groundcover beds shall include replacement of existing soil (for the entire groundcover bed) with prepared planting mix to the depth of the container (see detail).Spread granular pre-emergent across total planting bed at rates recommended by the manufacturer. Apply January 1-March 20 to target summer weeds and August 15 – September 15 to target winter weeds. All groundcover/ornamental grass beds to have weed barrier installed as well.

E. When plant pits have been backfilled approximately 2/3 full, water thoroughly before installing remaining soil to top of pit, eliminating all air pockets.

F. Lay weed barrier cloth prior to mulch.

G. Water all plants immediately after planting.

H. Mulch all planting areas 2”-3" deep immediately after planting.

I. Do not mound mulch against tree trunk.

J. Staking of all trees by Contractor in accordance with plan details. Plants shall stand plumb after staking and all trees shall be staked within 24 hours of planting. Stakes shall be driven into the ground (not root ball) until rigid.

3.02 FINE GRADING

Landscape Contractor will receive the project in rough grade condition. It is the Landscape Contractor’s responsibility to fine grade the ‘green’ areas; that includes adding topsoil as required to smooth out the rough grade and remove the clumps, clods, dips, bumps, lumps and removal of construction debris within the ‘green’ areas. Contractor to fine grade and provide positive drainage and even transition to drain inlets.

3.03 CLEAN UP

As planting operations proceed, all rope, wire, empty containers, rocks, clods and all other debris shall not be allowed to accumulate, but shall be removed daily and the site kept as tidy as possible at all times. After planting operations are finished, all paved areas shall be cleaned by sweeping and washing if necessary.

3.04 INSTALLATION MAINTENANCE

A. Contractor shall maintain the entire limit of landscape work during the course of landscape installation leading up to and including satisfactory completion of the Substantial Completion Review punch list. Plants must be in a healthy thriving condition.
B. Installation maintenance shall begin immediately after each plant is planted and continue until all SC punch list items are completed. This includes all watering operations (permanent irrigation, temporary irrigation and hand watering).
C. Installation maintenance shall also include watering, weeding, mowing and edging once a week, weeding, mulching, removal of dead materials, resetting plants to proper grades or

upright positions, repairs of soil settlements, dips and depressions, fertilizing and applying sprays or chemicals as necessary to keep the planting and new work free of ants, insects and disease.

3.05 PROTECTION

Planting areas and plants shall be protected during installation at all times against trespassing and damage of all kinds until acceptance of the project by the Owner. If any plants become damaged, injured or stolen, they shall be treated or replaced as directed by the Owners Representative at no additional cost to the Owner.

3.06 INSPECTION AND ACCEPTANCE

Work under this Section will be accepted by the Owner's Representative upon satisfactory completion of all work and "punch list" items generated by Substantial Completion review, but exclusive of replacement of plant materials under the Warranty Period.

3.07 OWNER RESPONSIBILITY

Owner shall take responsibility of the landscape areas by maintaining, monitoring and repairing as needed the irrigation system to ensure the irrigation system remains in working order. Owner shall also fertilize, mow and maintain the landscape in a healthy condition with best practices and industry standards for landscape maintenance.

3.08 WARRANTY PERIOD AND REPLACEMENTS

A. Apart from Natural Act of God occurrences, Contractor shall warrant unconditionally that all trees, shrubs, groundcovers planted under this contract will be healthy and in flourishing condition of active growth for one year from date of Substantial Completion.
B. Any delay in completion of planting operations which extends the planting into more than one planting season will extend the Warranty Period correspondingly.
C. Replace without cost to the Owner, and as soon as weather conditions permit, all dead plants and all plants not in vigorous, thriving conditions as determined by the Owner's Representative during and at the end of the Warranty Period. Plants shall be free of dead or dying branches and branch tips and shall bear foliage of a normal density, size and color. Replacements shall closely match adjacent specimens of the same species and shall be subject to all requirements of this specification.
D. Replacements shall be warranted through one (1) full growing season.

END OF SECTION

SECTION 32 91 00

TOPSOIL, PLACEMENT AND GRADING

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION

PART 1-GENERAL

1.01 DESCRIPTION

A. Refer to Section AB-Instructions to Proposers, Section AF – Subcontractor/Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures

B. Scope of work:

Scope of work under this Section of the specifications shall include all approved materials, labor, equipment, transportation and services required and incidental thereto, in conformity with the plans and specifications, including but not limited to furnishing and placing topsoil for finish grading for seeding, sodding and planting.

1.02 QUALITY ASSURANCE

Contractor to attend a pre-installation meeting and participate in an installation meeting with Owner's Representative.

1.03 SUBSTITUTIONS

Substitutions must be submitted 10 days before proposals are due, if accepted an Addendum will be issued, otherwise no substitutions are allowed. See Architects for any other requirements.

1.04 SUBMITTALS

A. Contractor shall provide required sample and soil analysis to Landscape Architect prior to delivery of any soil materials to site.
B. Topsoil test report for existing soil or imported topsoil (whichever is to be used on project).
C. MicroLife Humates Plus 0-0-4

PART 2- PRODUCTS

2.01 MATERIALS

Topsoil: ASTM D 5268, shall be fertile, friable, natural sandy loam surface soil with a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth and obtained from excavation or borrow operations having the following characteristics:

1. Ph value between 5.5 and 7.0
2. Liquid limit - topsoil not to exceed 50.
3. Plasticity index - 10 or less
4. Gradation - maximum of 40 % passing the No. 280 sieve.

A. On-site Topsoil Source: Reuse surface soil on-site if approved by Owner's Representative. Verify suitability of existing surface soil to produce topsoil. Supplement with imported or augmented topsoil from off-site sources when quantities are insufficient. Contractor responsible for testing topsoil (existing or imported) for compliance. Topsoil shall be free of subsoil, clay, lumps, weeds, weed seed, non-soil materials and other litter or contamination. Topsoil shall not contain roots, stumps, or stones larger than 1" inch.

Obtain topsoil from naturally well drained areas where topsoil occurs at a minimum depth of 4

inches and has similar characteristics to that found at the placement site. Do not obtain topsoil from areas infected with a growth of, or reproductive parts of, nut grass or other noxious weeds.

B. Off-site Topsoil Source: Import enriched topsoil or manufactured topsoil from off-site sources. Obtain topsoil from naturally well drained areas where topsoil occurs at a minimum depth of 4 inches and has similar characteristics to that found at the placement site. Do not obtain topsoil from areas infected with a growth of, or reproductive parts of, nut grass or other noxious weeds.

2.02 SCHOOL SITE

A. Bermuda solid sod areas (see plan) shall receive 2" inch of topsoil before sodding.
B. Hydromulch areas shall receive 1” of topsoil before hydromulch spraying.

2.03 AMENDMENTS

A. MicroLife Humates Plus 0-0-4
B. Compost – if on-site topsoil needs additional organic material.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Coordinate location of stockpile topsoil area with District and Project Manager.
B. Verify that excavation and subgrade operations have been completed to correct lines and grades and have been approved.

3.02 PLACEMENT

A. Scarify and breakup subgrade.
B. Spread topsoil in lifts according to plan grades.
C. Lightly roll or water topsoil and let topsoil settle.
D. Incorporate Humates into topsoil at a rate of 10Lbs per 1,000 sq. ft.
E. Grade the surface of all areas to meet the grades shown on the civil drawings. Add enough topsoil to allow for settlement so soil will be at correct grades and achieve positive drainage after settlement.
    1. Provide for positive drainage from all areas toward the inlets and drainage structures.
    2. Provide even transitions.
    3. Cut grade where sod meets hydromulch for even transition.
    4. All grading must be approved by Project Manager.
    5. Fill all settlement depressions at no additional cost to Owner.

F. Coordinate this operation with irrigation placement and all other trades.

3.03 CLEAN UP

Remove spilled topsoil from paved areas, curbs, gutters, etc. As operations proceed all excess soil and debris shall not be allowed to accumulate, but shall be removed daily and the site kept as tidy as possible at all times.

3.04 PROTECTION

Protect topsoil from wind and water erosion until planting is completed.

END OF SECTION

SECTION 32 92 00

LAWN SODDING & HYDROMULCH

CONDITIONS OF THE CONTRACT, DIVISION 00 AND DIVISION 01 APPLY TO THIS SECTION

PART 1-GENERAL

1.01 DESCRIPTION

A. Refer to Section AB-Instructions to Proposers, Section AF-Subcontractor/Manufacturer Prequalification, and Section 01 25 00 – Request for Substitution Procedures.

B. Scope of Work

Scope of work under this Section of the specifications shall include all approved materials, labor, equipment, transportation and services required and incidental thereto, in conformity with the plans and specifications, including but not limited to fine grading, hydromulching and sodding areas, fertilizing, installation maintenance, clean-up, guarantee and replacement and other work related thereto. Including:

A. Planting of sod within areas designated on Drawings for purpose of surface stabilization, channel stabilization, vegetation buffer strips or patching and lawn areas.
B. Sod is defined as blocks, squares, strips of turf grass with adhering soil used for vegetative planting. To be placed edge to edge for complete coverage.
C. A double row of sod shall be placed around all inlets within hydromulch areas.
D. A single row of sod shall be placed around all hard surfaces including all walks, drives, edge of building, etc. and property lines.
E. Lawn is defined as ground covered with fine textured grass kept neatly mowed.
F. Hydromulch to be applied in all disturbed areas that are not planted with solid sod (including right-of-ways).

1.02 QUALITY ASSURANCE

A. Contractor to attend a pre-installation meeting and participate in an installation meeting with Owner's Representative.
B. Sod certification shall be submitted from the sod nursery as to grass species and stripping date.
C. Seed certification shall be submitted from the supplier for each type of seed specified.

1.03 SUBSTITUTIONS

Substitutions must be submitted 10 days before proposals are due, if accepted, an Addendum will be issued, otherwise no substitutions are allowed. See Architects for any other requirements.

PART 2- PRODUCTS

2.01 MATERIALS Project site includes hydromulch and Common Bermuda solid sod (see plan for each indicated area).

A. Hydromulch shall be accomplished according to the following schedule:

Summer application (April 1 - September 30) per 1000 square feet
50# wood cellulose fiber mulch
1.5# - 2# hulled Bermuda seed
15# 13-13-13 water soluble fertilizer

Winter application (October 1 - February 14) per 1000 square feet
50# wood cellulose fiber mulch

2#-3# unhulled Bermuda seed
2#-3# hulled Bermuda seed
2# gulf rye seed
15# 13-13-13 water soluble fertilizer

Late Winter/Early Spring application (February 15 - March 31) per 1000 square feet
50# wood cellulose fiber mulch
2#-3# unhulled Bermuda seed
2#-3# hulled Bermuda seed
15# 13-13-13 water soluble fertilizer

Seed shall be certified 90 % pure and conform to the Federal Seed Act and Texas Seed Law.

Hydromulch to be applied at an accelerated schedule in order for the grass to grow prior to the start of school. Hydromulch must achieve full growth prior to Substantial Completion date.

B. Solid sod as called for on plans. Sod shall be certified or nursery/farm grown grass true to the name and variety. Sod shall be substantially free of noxious weeds, disease, insects, thatch and undesirable grasses.

Sod shall be nursery grown and have a healthy root system of dense thickly matted roots throughout the soil of the sod for a minimum thickness of 1 inch. Sod shall be rectangular in size approx 16”x24”.

Schedule deliveries to coincide with topsoil operations and laying. During wet weather allow sod to dry sufficiently to prevent tearing. During dry weather, protect sod from drying out. Water as necessary to insure vitality and to prevent excess loss of soil while handling. Sod which dries out will be rejected. Sod shall be cut delivered and installed within 24 hours of cutting.

C. Fertilizer – Organic Microlife 6-2-4

D. Bank Sand – Free of clay lumps, roots, grass, salt or other foreign material.

E. Humates – MicroLife Humates Plus 0-0-4 applied in ALL hydromulch areas and in TOPSOIL for landscape sod areas (See Topsoil Section 32 92 00)

PART 3 - EXECUTION

3.01 PREPARATION - Grades to be reviewed by District, Project Manager, Civil Engineer and Landscape Architect prior to sodding or hydromulch operations.

A. Protection
1. Take care and preparation in work to avoid conditions which will create hazards. Post signs or barriers as required.
2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.

B. Surface Preparation for hydromulch

1. Remove all existing weeds by hand or herbicide. Remove top growth and roots.
2. Scarify small areas (less than 500sq ft) by hand raking to 3” deep to remove rocks and construction debris and break up compacted soil.
3. Larger areas to be prepared by removing large debris by hand, then using a Rock rake to loosen soil and remove rocks, then using a Harley rake to push smaller rocks

into a pile and remove. Several passes with each type of equipment may be required to reach an acceptable soil condition that is ready for seeding.
4. At each step continue to remove soil clods, rocks, weeds, roots and construction debris above and below grade.
5. Add 1" topsoil.
6. Refine grades for positive drainage to area inlets.
7. Grades to be reviewed by District, Project Manager, Civil Engineer and Landscape Architect prior to next phase.

C. Surface Preparation for solid sod
1. Remove all existing weeds by hand or herbicide. Remove top growth and roots.
2. Scarify small areas (less than 500sq ft) by hand raking to 3" deep to remove rocks and construction debris and break up compacted soil.
3. Larger areas to be prepared by removing large debris by hand, then using a Rock rake to loosen soil and remove rocks, then using a Harley rake to push smaller rocks into a pile and remove. Several passes with each type of equipment may be required to reach an acceptable soil condition that is ready for seeding.
4. At each step continue to remove soil clods, rocks, weeds, roots and construction debris above and below grade.
5. See TOPSOIL section for amended topsoil requirements. Add a minimum of two (2") inches of topsoil as a setting bed for landscape sod.
6. Refine grades for positive drainage to area drains. Sod areas to be graded to achieve proper final elevations, eliminating all bumps, ridges or depressions to provide for smooth drainage.
7. Grades to be reviewed by District, Project Manager, Civil Engineer and Landscape Architect prior to sodding.

3.02 INSTALLATION

A. Site Tolerances

Final grade after complete shall be one inch below top of adjacent pavement of any kind. Coordinate with Civil drainage plans for possible conflicts, such as sheet drainage across sidewalks, etc. Bring all conflicts to the Project Managers attention for resolution.

B. Hydromulch
1. Apply Humates at a rate of 10lbs per 1,000 sq ft Lightly rake to incorporate into soil. Process must be documented (video/photos) by contractor while applying product.
2. Add 1" inch of topsoil and fine grade.
3. Apply seed with approved spray equipment and water (to keep moist) seeded areas.
4. Hydromulch to be applied at an accelerated schedule in order for the grass to grow prior to the start of school.
5. Reseed areas that do not show prompt germination. Bare areas must be less than 12" in any direction.
6. Hydromulch must achieve full growth prior to Substantial Completion date.

C. Solid sod
1. Lay sod in rows with staggered joints on 2" of topsoil. Butt sections closely without overlapping or leaving gaps between sections. Topdress/Sand fill sod joints.
2. Lay single row of sod along all hard surfaces including pedestrian, vehicular, building perimeter, back of curbs and mow strips within hydromulch areas.
3. Lay a double row of sod around inlet drains within the hydromulch areas.
4. Cut sod where sod meets hydromulch for an even transition from one area to the other.
5. Sod blocks shall not prevent drainage away from the walk or create ponding issues.

6. On all slopes and detention pond, lay sod perpendicular to slope and secure every row with metal 2 pronged staples at a maximum of 2 feet on center. Drive staples flush with soil portion of sod.
7. Roll sodded areas in two directions perpendicular to each other. Repair and reroll areas with depressions, lumps or other irregularities.
8. Fertilize sod areas (dependant on time of year).
9. Water sodded areas immediately after sod laying to obtain moisture penetration through sod into top four (4") inches of soil.

3.03 CLEAN UP

As planting operations proceed, all rope, wire, empty containers, rocks, clods and all other debris shall not be allowed to accumulate, but shall be removed daily and the site kept as tidy as possible at all times. After planting operations are finished, all paved areas shall be cleaned by sweeping and washing if necessary.

3.04 PROTECTION

Planting areas shall be protected during installation at all times against trespassing and damage of all kinds until acceptance of the project by the Owner.

3.05 INSTALLATION MAINTENANCE

A. Contractor shall maintain the entire limit of landscape work during the course of landscape installation leading up to and including satisfactory completion of the Substantial Completion Review punch list.
B. Installation maintenance shall begin immediately after hydromulching or sodding and continue until all Substantial Completion punch list items are completed. Installation maintenance includes all watering operations (permanent irrigation, temporary irrigation and hand watering). Contractor is responsible for temporary and/or hand watering for hydromulch establishment.
C. Hydromulch must achieve full growth with bare areas less than 12” in any direction.
D. Installation maintenance shall include watering, weeding, mowing and edging once a week, reseeding, removal of dead materials, repairs of soil settlements, dips and depressions, fertilizing and applying sprays or chemicals as necessary to keep the grass free of insects and disease.

3.06 INSPECTION AND ACCEPTANCE

Work under this Section will be accepted by the Owner's Representative upon satisfactory completion of all work and "punch list" items generated by Substantial Completion review.

3.07 WARRANTY PERIOD AND REPLACEMENTS

Contractor shall warrant unconditionally that grass planted under this contract will be healthy and in flourishing condition of active growth for two years from date of Substantial Completion.

Any delay in completion of planting operations which extends the planting into more than one season will extend the Warranty Period correspondingly.

Replace without cost to the Owner, and as soon as weather conditions permit, all dead grass as determined by the Owner’s Representative during and at the end of the Warranty Period. Replacements shall be warranted through one full growing season.

END OF SECTION

SECTION 33 05 13.00
MANHOLES AND STRUCTURES

PART 1 G E N E R A L

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). If Contract is 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 (Non-shrink)

I. ASTM D 698 -Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-Ib/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 P R O D U C T S

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 4,500 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 4,500 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 E X E C U T I O N

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 non-shrink 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 3 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 corner 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

SECTION 33 05 13.13
MANHOLE GRADE ADJUSTMENT

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Adjusting elevation of manholes, inlets, and valve boxes to new grades.

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 P R O D U C T S

2.1 CONCRETE MATERIALS

A. Provide concrete, conforming to requirements of Division 33.

B. Provide precast concrete manhole sections and adjustment rings conforming to requirements of Division 33.

C. Provide mortar conforming to requirements of City of Houston Standard Specifications Section 04016 - Mortar.

2.2 CAST-IRON MATERIALS

A. Provide cast-iron materials conforming to requirements of Division 33.

2.3 PIPING MATERIALS

A. For riser pipes and fittings, refer to Division 33.

2.4 MASONRY MATERIALS FOR STORM SEWER MANHOLES AND INLETS

A. Provide brick masonry units conforming to the requirements of Division 32.

PART 3 E X E C U T I O N

3.1 EXAMINATION

A. Examine existing structure, valve box, frame and cover or inlet box, frame and cover or inlet, piping and connections for damage or defects affecting adjustment to grade. Report damage or defects to Project Manager.

3.2 ESTABLISHING GRADE

A. Coordinate grade related items with existing grade and finished grade or paving, and relate to established bench mark or reference line.

3.3 ADJUSTING MANHOLES AND INLETS

A. Rebuild adjustment portion of manhole or inlet by adding or removing Adjustments. Follow procedures for the type of structure being adjusted detailed in Division 33.

B. Salvage and reuse cast-iron frame and cover or grate.

C. Protect or block off manhole or inlet bottom using wood forms shaped to fit so that no debris or soil falls to bottom during adjustment.

D. Verify that manholes and inlets are free of visible leaks as result of reconstruction. Repair leaks in manner subject to Project Manger's approval.

3.4 ADJUSTING VALVE BOXES

A. Salvage and reuse valve box and surrounding concrete block as approved by Project Manager. No separate pay.

B. Remove and replace 6 inch ductile iron riser pipe with suitable length for depth of cover required to establish adjusted elevation to accommodate actual finish grade.

C. Reinstall valve box and riser piping plumbed in vertical position. Provide minimum 6 inches telescoping freeboard space between riser pipe top butt end and interior contact flange of valve box for vertical movement damping.

D. After valve box has been set, aligned, and adjusted so that top lid is level with final grade.

3.5 BACKFILL AND GRADING

A. Backfill area of excavation surrounding each adjusted manhole, inlet, and valve box and compact according to requirements of Division 31.

B. Grade ground surface to drain away from each manhole and valve box. Place earth fill around manholes to level of upper rim of manhole frame. Place earth fill around valve box concrete slab.

C. In unpaved areas, grade surface at uniform slope of 1 to 5 from manhole frame to natural grade. Provide minimum of 4 inches of topsoil conforming to requirements of Division 32.

END OF SECTION

SECTION 33 05 16.13
PRECAST CONCRETE UTILITY STRUCTURES

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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 4,500 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 E X E C U T I O N

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

SECTION 33 05 16.16
CONCRETE FOR UTILITY CONSTRUCTION

PART 1 G E N E R A L

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). If Contract is 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 - Standard Specification for Chemical Admixtures for Concrete.

FF. ASTM C 595 - Standard Specification for Blended Hydraulic Cements.

GG. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and 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 P R O D U C T S

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.

C. Aggregate:
1. Coarse Aggregate: ASTM C 33. Unless otherwise indicated, use following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of narrowest dimension between sides of forms, nor larger than 3/4 of minimum clear spacing between reinforcing bars.
2. Fine Aggregate: ASTM C 33.
3. Determine potential reactivity of fine and coarse aggregate in accordance with Appendix to ASTM C 33.

D. Air Entraining Admixtures: ASTM C 260.

E. Chemical Admixtures:
1. Water Reducers: ASTM C 494, Type A.
2. Water Reducing Retarders: ASTM 494, Type D.
3. High Range Water Reducers (Superplasticizers): ASTM C 494, Types F and G.

F. Prohibited Admixtures: Admixtures containing calcium chloride, thiocyanate, or materials that contribute free chloride ions in excess of 0.1 percent by weight of cement.

G. Reinforcing Steel:

1. Use new billet steel bars conforming to ASTM A 615, ASTM A 767, or ASTM A 775, grade 60, as shown on Drawings. Use deformed bars except where smooth bars are specified. When placed in work, keep steel free of dirt, scale, loose or flaky rust, paint, oil or other harmful materials.
2. Where shown, use welded wire fabric with wire conforming to ASTM A 185 or ASTM A 884. Supply gauge and spacing shown, with longitudinal and transverse wires electrically welded together at points of intersection with welds strong enough not to be broken during handling or placing.
3. Wire: ASTM A 82. Use 16 1/2 gauge minimum for tie wire, unless otherwise indicated.

H. Fiber:
1. Fibrillated Polypropylene Fiber:
   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.
   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.
      6) Minimum Average Tensile Strength: 50,000 psi.
      7) 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.

I. 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.

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. Classification:

Class	Type	Minimum Compressive Strength (LBS/Sq.In.)		Maximum 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.						

E. Add steel or polypropylene fibers only when called for on Drawings or in another section of these Specifications.

F. Determine air content in accordance with ASTM C 138, ASTM C 173 or ASTM C 231.

G. 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 E X E C U T I O N

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 PLACING REINFORCEMENT

A. Place reinforcing steel accurately in accordance with approved Drawings. Secure steel adequately in position in forms to prevent misalignment. Maintain reinforcing steel in place using approved concrete and hot-dip galvanized metal chairs and spacers. Place reinforcing steel in accordance with CRSI Publication "Placing Reinforcing Bars." Request inspection of reinforcing steel by Owner's Representative and obtain acceptance before concrete is placed.

B. Minimum spacing center-to-center of parallel bars: 2 1/2 times nominal bar diameter. Minimum cover measured from surface of concrete to face of reinforcing bar unless shown otherwise on Drawings: 3 inches for surfaces cast against soil or subgrade, 2 inches for other surfaces.

C. Detail bars in accordance with ACI 315. Fabricate reinforcing steel in accordance with CRSI Publication MSP-1, "Manual of Standard Practice." Bend reinforcing steel to required shape while steel is cold. Excessive irregularities in bending will be cause for rejection.

D. Do not splice bars without written approval of Owner's Representative. Approved bar bending schedules or placing drawings constitute written approval. Splice and development length of bars shall conform to ACI 318, Chapters 7 and 12, and as shown on Drawings. Stagger splices or locate at points of low tensile stress.

3.3 .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.

3.4 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 through 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 when temperature is 35 degrees F and rising. Take temperature readings in 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.

3.5 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.

3.6 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 waterstop from direct rays of sun during entire exposure and until exposed portion of waterstop is embedded in concrete.

C. 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.

D. 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.

E. 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.

F. 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 Owner.

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

SECTION 33 06 10.14
POLYVINYL CHLORIDE (PVC) PIPE

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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.

H. 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.

I. 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.

J. 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 2.2E.

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 E X E C U T I O N

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

SECTION 33 06 10.15
DUCTILE IRON PIPE AND FITTINGS

PART 1 G E N E R A L

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). If the 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 P R O D U C T S

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 E X E C U T I O N

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	5
12 and smaller	4

END OF SECTION

SECTION 33 06 40.10
HDPE SOLID AND PROFILE WALL PIPE

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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	18”–120”

   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 MINIMUM)	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.

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 following information:
   1. Pipe size.
   2. Pipe class.
   3. Production code.
   4. Material designation.

PART 3 E X E C U T I O N

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 auguring of pipe.

D. Bedding and backfill: Conform to requirements of Division 31.

END OF SECTION

SECTION 33 06 40.11
REINFORCED CONCRETE PIPE

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Reinforced concrete pipe for storm sewers.

1.2 MEASUREMENT AND PAYMENT

A. Stipulated Price (Lump Sum). If the 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 SUSTAINABLE DESIGN (LEED) REQUIREMENTS

A. GENERAL LEED REQUIREMENTS: Reference Section 01 35 45 for general information regarding sustainable requirements for this LEED Silver Project.

B. LEED PROJECT CHECKLIST: Reference the *LEED Project Checklist* (included in Section 01 35 45) for an understanding of the project's LEED goals, including quantities and percentages within the required credits.

C. LEED SUBMITTAL PROCEDURE: All Subcontractor(s) and vendor(s) providing materials and products under this Section shall be REQUIRED to submit a fully-executed *Sustainable Product Submittal Sheet* (included in Section 01 35 45) regardless of whether credits are expected for materials and products provided under this Section.

1.5 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 P R O D U C T S

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 E X E C U T I O N

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

SECTION 33 11 00
WATER UTILITY DISTRIBUTION PIPING

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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. Pre-stressed Concrete Cylinder Pipe, Bar-Wrapped Pipe and Steel Pipe: Welded joints (see Paragraph 3.6 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 E X E C U T I O N

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 manufacturer's representative when connecting or modifying existing pre-stressed 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 pre-stressing 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.
3. Furnish welded joints with trimmed spigots and interior welds for 36-inch and larger pipe.
4. 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 ½ 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.
5. 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.
6. 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.
7. Welding rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.
8. 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.
9. 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.
10. 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.
11. Make tack weld of same material and by same procedure as completed weld. Otherwise, remove tack welds during welding operation.

12. Remove dirt, scale, and other foreign matter from inside piping before tying in sections, fittings, or valves.
13. 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 ½ degrees.
    d. 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 pre-stressed 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. Re-tempering 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 re-tempering. 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 non-shrink 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 coatings 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

SECTION 33 12 13.10
TAPPING SLEEVES AND VALVES

PART 1 G E N E R A L

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). If Contract is 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 Division1.

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 P R O D U C T S

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 E X E C U T I O N

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

SECTION 33 12 13.12
WET CONNECTIONS

PART 1 G E N E R A L

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). If the 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 P R O D U C T S

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 E X E C U T I O N

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

SECTION 33 12 16
WATER UTILITY DISTRIBUTION VALVES

PART 1 G E N E R A L

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 P R O D U C T S

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.

B. 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.

C. Gate Valves 1-1/2 inches in Diameter and Smaller: 125 psig; bronze; rising-stem; single-wedge; disc type; screwed ends.

D. 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.

E. 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.

F. 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 anti-friction washer located above thrust collar for operating torque.

G. Stem Nut: Independent or integrally cast of ASTM B 62 bronze.

H. 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.

I. 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.

J. 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:
   1. 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.
   2. O rings: For AWWA C 500, Section 3.12.2. For AWWA C 515, Section 4.2.2.5.
   3. 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.
   4. Stem Nut: Machined from ASTM B 62 bronze rod with integral forged thrust collar machined to size; non-rising.
   5. Stem Seals: Consist of three O-rings, two above and one below thrust collar with anti-friction washer located above thrust collar for operating torque.

6. Bolts: AWWA C 500 Section 3.4 or AWWA C 515 Section 4.4.4; stainless steel; cadmium plated, or zinc coated.
7. Discs: Cast iron with bronze disc rings securely penned into machined dovetailed grooves.
8. 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.
9. Provide bypass for valves 24 inches and larger.
10. 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.
11. 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.
12. 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 E X E C U T I O N

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 bullheaded 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

SECTION 33 12 19
WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 G E N E R A L

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 P R O D U C T S

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 E X E C U T I O N

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

SECTION 33 12 40
VALVE BOXES, METER BOXES, AND METER VAULTS

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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 6-inch ductile-iron, thickness Class 51 riser pipes in accordance with Division 33.
2. 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 4,500 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 4,500 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 E X E C U T I O N

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 12-inch-thick bed of cement stabilized 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 3 inches above natural grade. Grade area around vault to sheet flow away from vault.
   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 cement stabilized 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

SECTION 33 13 00.00
DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Disinfection of potable water lines.

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 651 - Standard for Disinfecting Water Mains.

PART 2 P R O D U C T S -Not Used

PART 3 E X E C U T I O N

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.

3.3 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 water lines in accordance with AWWA C 651.
   3. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 1.0 parts per million parts of water.
   4. Open and close valves in lines being sterilized several times during contact period.
   5. If chemical compound is used for sterilizing agent, place in pipes as directed by Owner's Representative.

3.4 BACTERIOLOGICAL TESTING

A. Contractor is responsible for coordinating and paying for testing. Contractor shall provide, Owner, Architect and Engineer with test results.

B. 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, the Contractor shall provide additional disinfection operations at no additional cost to the Owner.

3.5 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

SECTION 33 13 00.10
HYDROSTATIC TESTING OF PIPELINES

PART 1 G E N E R A L

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 P R O D U C T S – Not Used

PART 3 E X E C U T I O N

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. Fire water lines and mains may need to be pressure tested to 200 psi. Contractor shall coordinate requirements with local jurisdiction and local fire department.

E. 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.

F. 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

SECTION 33 31 00.00
SANITARY UTILITY SEWERAGE PIPING

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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 E X E C U T I O N

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 micro-tunneling 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 1until 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 CODES

A	STREET ROW, HEAVY TRAFFIC
B	STREET ROW, LIGHT TRAFFIC
C	EASEMENT, POOR ACCESS
D	EASEMENT, GOOD ACCESS
E	PARKING LOT, POOR ACCESS
F	PARKING 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 B (2)
E	TREES/SHRUBS
F	CLOSE TO FENCE
G	OPEN AREA E (5)
H	MOVABLE BUILDING
I	UNMOVABLE BUILDING
J	OVERHEAD UTILITIES
K	WATERWAY 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
URC	UNREINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE

WEATHER CODES

DRY - WET

CODE DESCRIPTIONS

CRACKS

RC-RADIAL LC-LONGITUDINAL F

CODES	DESCRIPTION	USE IN
A (1)	< ½" W, 1' L	CRK
B (2)	< ½" W, 1' – 2' L	CRK
C (3)	< ½" W, >2' L	CRK
D (4)	> ½" W, < 1' L	CRK
E (5)	> ½" W, 1' – 2' L	CRK
F (6)	> ½" W, > 2' L	CRK
G (7)	HOLE IN PIPE – SMALL	
H (8)	PIPE MISSING - < 60º	
I (9)	PIPE MISSING - > 60º	

JOINTS

MJ – MISALIGNED JOINT BJ-BROKEN JOINT

DESCRIPTION		USE IN
A (3)	DRP 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"
PRT SER 1" – 2"	
C (3)	PRY SER 2" – 3"
D (4)	PRT SER 3" +
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)

DESCRIPTION	
A	BEGIN ¼ PIPE WATER
B	BEGIN ½ PIPE WATER
C	CAMERA UNDERWATER
D	END CAMERA UNDERWATER
E	END ½ PIPE WATER

END ¼ PIPE WATER

STRUCTURAL

DS-DETERIORATED; OS-OVALITY; CS COLLAPSED

CODES	DESCRIPTION	USE IN
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

SECTION 33 31 00.10
ACCEPTANCE TESTING FOR SANITARY SEWERS

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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 E X E C U T I O N

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 slip-lined 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 slip-lining, 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 ft^3/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.
   a. 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 slip-lined 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.

G. 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.

Table 33 31 00.10-1

WATER TEST ALLOWABLE LEAKAGE

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE*	
	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 30 36 42	0.0177 0.0197 0.0237 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 sewer is identified as located within 25-year flood plain.

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	0.8548	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	1.5196	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	2.3743	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	3.4190	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	5.3423	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	7.6928	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	10.4708	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	13.6762	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	17.3089	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	21.3690	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	25.8565	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
*Add T times for each additional 2-foot depth. (The values listed above have been extrapolated from ASTM C 924-85)			

Table 33 31 00.10-5
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

SECTION 33 41 00
STORM UTILITY DRAINAGE PIPING

PART 1 G E N E R A L

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). If Contract is 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 to avoid contact with ground.

D. Unload pipe, fittings, and appurtenances as close as practical to location of 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 P R O D U C T S

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 E X E C U T I O N

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

PART 1 G E N E R A L

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). If Contract is 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 P R O D U C T S

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 E X E C U T I O N

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