Volume 01

Cimarron Elementary School Replacement

GPISD Project #: B101

CSP#: 25-604

GALENA PARK INDEPENDENT SCHOOL DISTRICT

GPISD
FACILITY PLANNING
AND CONSTRUCTION

Proposal Checklist

Project:	Cimarron Elementary School Replacement
Project #:	B101
Total Project Budget:	$34,830,200
Pre-Proposal Conference:	Galena Park ISD Administration Building 14705 Woodforest Blvd, Houston, TX 77015 October 31, 2025 at 2:00 PM C/T Attendance is highly recommended.
Proposal Opening Location:	Galena Park ISD Administration Building 14705 Woodforest Blvd, Houston, TX 77015
Proposal Deadline:	November 18, 2025 at 2:00 PM C/T

Items Due 5 Business Days Prior to Proposal Opening – November 11, 2025

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

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

Items Due at Bid Time –November 18, 2025 at 2:00 PM C/T

Bid Package including:

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

Bid Attachments

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

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

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

CSP #	25-604
Project:	Cimarron Elementary School Replacement
Type:	Competitive Sealed Proposal
Issue Date:	October 26, 2025
Question Deadline:	November 11, 2025
Response Deadline:	November 18, 2025

25-604 **PROPOSAL** Close Date and Time: November 18, 2025 Base @ 2:00 PM C/T Alternates @ 3:00 PM C/T

Galena Park Independent School District (GPISD) is requesting **Competitive Sealed Proposals (CSP** 25-604**)** for Cimarron Elementary School Replacement **(GPISD Project** B101**)**. **Proposals are due on November 18, 2025 Base at 2:00 PM C/T & Alternates at 3:00 PM C/T**, after which proposals will be opened publicly and read aloud at the GPISD Administration Building. Submissions must be delivered to the **Facilities Planning and Construction Department** in the GPISD Administration Building, 14705 Woodforest Blvd., Houston, TX 77015, in a sealed envelope by the close date and time stated in this Proposal event. A Proposal Security in the amount of ten percent (10%) of the proposal amount is required.

The scope of work includes Demolition, detention, drainage, masonry, concrete, steel framing, roofing/waterproofing, doors and frames, flooring, food service equipment, elevator, painting, fire alarm, mechanical, electrical, and plumbing systems.

A pre-proposal conference will be held at the **GPISD Administration Building**, on **October 31, 2025 at 2:00 PM C/T**. Attendance is highly recommended.

Proposal Documents will be available on October 26, 2025 on the district website, and on the GPISD eBid system https://galenaparkisd.ionwave.net.

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

Ship To Information

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

Billing Information

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

Activities

Pre-Proposal Conference	October 31, 2025 at 2:00 PM C/T
Pre-Proposal Information Due	November 11, 2025
Response to Questions Due	November 13, 2025
Board of Trustee Meeting	January 12, 2026
Contract Execution	January 13, 2026
Owner Receives Bonds and Insurance	January 19, 2026
Notice to Proceed	January 26, 2026
Substantial Completion	March 1, 2027 - Building June 28, 2027 - Demo
Final Completion	September 17, 2027

Proposal Attributes

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

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

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

4. Attachments Required
Be sure to submit all required documents and forms.

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

6. Submission Required PRIOR to Proposal Opening
The following forms are required **5 days prior to the proposal opening**:

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

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

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

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

7. Instructions to Proposers for Contracts for Construction

ARTICLE 1. DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 2. PROPOSER'S REPRESENTATIONS

2.1 The Proposer by making a Proposal represents that:

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

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

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

ARTICLE 3. PROPOSAL DOCUMENTS

3.1 Copies

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

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

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

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

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

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

3.2 Interpretation or Correction of Proposal Documents

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

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

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

3.3 Substitutions

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

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

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

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

3.4 Addenda

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

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

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

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

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

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

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

3.5 Interpretation or Correction of Proposal Documents

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

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

3.7 Addenda

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

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

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

ARTICLE 4. PROPOSAL PROCEDURES

4.1 Form and Style of Proposals

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

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

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

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

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

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

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

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

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

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

Proposal Phase Procedures
Contractor Proposed Project Personnel

4.2 Proposal Bond and Insurance

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

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

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

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

4.3 Submission of Proposals

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

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

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

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

4.4 Modification or Withdrawal of Proposal.

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

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

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

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

ARTICLE 5. PRE & POST PROPOSAL INFORMATION

5.1 Submittals

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

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

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

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

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

ARTICLE 6. CONSIDERATION OF PROPOSALS

6.1 Opening of Proposals

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

6.2 Rejection of Proposals

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

6.3 Acceptance of Proposals (Award)

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

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

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

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

ARTICLE 7. PERFORMANCE AND PAYMENT BONDS

7.1 Bond Requirements

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

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

7.2 Time of Delivery and Form of Bonds

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

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

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

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

ARTICLE 8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 Form to be used

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

8. PROJECT INFORMATION

Project:	**Cimarron Elementary School Replacement**
Project Address:	**816 Cimarron St. Houston, TX 77015**
Project #:	**B101**
Total Project Budget:	**$34,830,200**
Substantial Completion Date:	**June 28, 2027**

The Architect/Engineer is:	**S. Chu Architects, Inc.**
	1300 W. Sam Houston Parkway S. Suite 121 Houston, TX 77042
Contact Name:	**Madeline Chu**
Contact Email:	**smchu@earthlink.net**

9. PROPOSAL ACKNOWLEDGEMENT

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

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

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

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

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

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

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

10. PROPOSAL BOND FOR BUILDING CONSTRUCTION CONTRACTS

Proposal Bond for Building Construction Contracts

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

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

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

11. PROPOSAL PHASE PROCEDURES

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

PART 1 – GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

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

1.3 SUBMITTALS

A. Qualification Statements
B. Project Lists
C. References

1.4 QUALITY ASSURANCE

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

PART 2 – PROCEDURES

2.1 PROPOSER QUALIFICATION STATEMENTS

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

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

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

02 Fax submissions will not be accepted.

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

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

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

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

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

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

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

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

2.2 ELECTRONIC AVAILABILITY OF PROPOSAL DOCUMENTS

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

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

2.3 PROPOSAL PHASE - REQUEST FOR INFORMATION

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

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

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

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

2.4 ADDENDA

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

12. FELONY CONVICTION NOTICE

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

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

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

(Required: Check only one)

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

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

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

13. AFFIDAVIT OF NON-COLLUSION

Anti-Collusion Statement

The undersigned affirms that they are duly authorized to execute this proposal, that this company, corporation, firm, partnership or individual has not prepared this proposal in collusion with any other proposer, and that the contents of this proposal as to prices, terms or conditions of said proposal have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this proposal.

☐ I agree.

14. CERTIFICATE OF RESIDENCY

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

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

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

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

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

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

Certificate of Residency

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

_____

_____

_____

_____

15. VERIFICATION OF BUSINESS TYPE

Verification of Business Type
(Required: Check only one)

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

Verification of Business Type

Provide state of incorporation or additional details if applicable

16. CONFLICT OF INTEREST QUESTIONNAIRE

Conflict of Interest Questionnaire

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

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

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

Local government officers:

Board of Trustees & Superintendent of Schools

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

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

- ☐ Yes
- ☐ No

17. CONTRACTOR'S PROPOSED PROJECT PERSONNEL

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

Principal in Charge

_____

_____

Project Manager

_____

_____

Assistant Project Manager (as applicable)

_____

_____

Construction Superintendent

_____

_____

Assistant Superintendent (as applicable)

_____

_____

18. ANTITRUST CERTIFICATION STATEMENT

Antitrust Certification Statement

Per Tex. Government Code § 2155.005

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

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

(Required: Check only one)

- ☐ Agree
- ☐ Do Not Agree

19. FORM 1295 - CERTIFICATE OF INTERESTED PARTIES

Form 1295 - Certificate of Interested Parties

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

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

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

Please note the following:
Box 2: Please enter Galena Park ISD
Box 3: Please use CSP# 25-604 as the identification number being requested and Cimarron Elementary School Replacement as description of goods or services.

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

(Required: Check only one)

- ☐ Yes
- ☐ No

20. CONTRACT DOCUMENTS DEVIATIONS OR EXCEPTIONS

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

(Required)

☐ I have Read and Agree

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

(Required: Check only one)

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

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

Proposal Lines

BASE PROPOSAL

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

1.1 BASE PROPOSAL:	**$ _____**
1.2 Owner's Contingency Allowance:	**750,000**
1.3 Graphics Allowance:	**100,000**
1.4 Base Proposal + Owner's Contingency Total:	**$ _____**

_____

(Written Total Amount)

Acknowledge Addendum(s)

Acknowledge receipt of Addendum 1 through _____

Alternate Proposal Lines

ALTERNATES PROPOSAL

Alternate No. 1
(Response required)

1 BASE PROPOSAL REDUCTION: **$ _____**

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

Alternate No. 2 State in the proposal form the amount to be added to the base proposal to furnish and install the following Air Handling Units as listed in the specifications. Include estimated lead time/delivery to be assessed as part of the selection process.
(Response required)

2a Carrier: **$ _____**

2b Temtrol: **$ _____**

2c Trane: **$ _____**

Alternate No. 3 State in the proposal form the amount to be added to the base proposal to furnish and install the following Chillers as shown in the Contract Documents. Include estimated lead time/delivery to be assessed as part of the selection process
(Response required)

3a Carrier Standard Efficiency Chillers: **$ _____**

3b Carrier High Efficiency Chillers: **$ _____**

3c Trane Standard Efficiency Chiller: **$ _____**

3d Trane High Efficiency Chillers: **$ _____**

3e York Standard Efficiency Chillers: **$ _____**

3f York High Efficiency Chiller: **$ _____**

Alternate Proposal Lines

ALTERNATES PROPOSAL

Alternate No. 4 - State in the proposal form the amount to be added to the base proposal to furnish and install the following BMCS system
(Response required)

4a Reliable Controls by Unify Energy Solutions **$** _____

4b Trane Controls by Hunton Group **$** _____

4c ALC by Automated Logic Houston **$** _____

4d Distech Controls **$** _____

SUBCONTRACTOR LISTING

(Line excluded from response total)

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

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

Package Attributes

1. **Self-Performed**

Will your company be self-performing ALL work.

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

(Required: Check only one)

Mechanical Primary _____

Mechanical Secondary _____

Electrical Primary _____

Electrical Secondary _____

Plumbing Primary _____

Plumbing Secondary _____

Site Work Primary _____

Site Work Secondary _____

Site Utilities Primary _____

Site Utilities Secondary _____

Concrete Primary _____

Concrete Secondary _____

Masonry Primary _____

Masonry Secondary _____

Steel Fabrication Primary _____

Steel Fabrication Secondary _____

Steel Erection Primary _____

Steel Erection Secondary _____

Dampproofing Primary _____

Dampproofing Secondary _____

Fire Sprinkler Primary _____

Fire Sprinkler Secondary _____

Roofing Primary _____

Roofing Secondary _____

Hollow Metal Primary _____

Hollow Metal Secondary _____

SCPL Doors Primary _____

SCPL Doors Secondary _____

Finish Hardware Primary _____

Finish Hardware Secondary _____

Glass & Glazing Primary _____

Glass & Glazing Secondary _____

Gyp Bd Systems Primary _____

Gyp Bd Systems Secondary _____

Ceramic Tile Primary _____

Ceramic Tile Secondary _____

Flooring Primary _____

Flooring Secondary _____

Painting Primary _____

Painting Secondary _____

Toilet Partitions Primary _____

Toilet Partitions Secondary _____

Toilet Acc's. Primary _____

Toilet Acc's. Secondary _____

Casework Primary _____

Casework Secondary _____

Fire Alarm Primary _____

Fire Alarm Secondary _____

BCMS Primary _____

BCMS Secondary _____

Data / Tech Primary _____

Data / Tech Secondary _____

Security Primary _____

Security Secondary _____

Aluminum Canopy _____

Small Business Enterprise Program (SBEP)

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

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

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

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

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

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

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

(Response required)

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

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

Small Business Enterprise (SBE) Participation Scoring Criteria:

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

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

Contractor Information

Company Name: _____

Contact Name: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

Contractor Notes:

_____

_____

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

Print Name _____ Signature_____

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

Request for Taxpayer Identification Number and Certification

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

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

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

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

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

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

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

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

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

☐ Other (see instructions) ►

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

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

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

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

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

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

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

Social security number

			–			–				

or

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

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

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

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

General Instructions

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

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

Purpose of Form

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

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

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

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

By signing the filled-out form, you:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2. The treaty article addressing the income.

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

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

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

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

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

Backup Withholding

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

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

Payments you receive will be subject to backup withholding if:

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

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

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

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

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

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

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

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

Updating Your Information

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

Penalties

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

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

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

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

Specific Instructions

Line 1

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

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

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

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

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

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

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

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

Line 2

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

Line 3

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

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

Line 4, Exemptions

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

Exempt payee code.

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

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

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

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

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

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

5—A corporation

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

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

8—A real estate investment trust

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

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

11—A financial institution

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

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

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

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

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

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

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

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

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

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

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

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

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

G—A real estate investment trust

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

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

J—A bank as defined in section 581

K—A broker

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

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

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

Line 5

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

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

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

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

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

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

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

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

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

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

Part II. Certification

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

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

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

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

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

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

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

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

What Name and Number To Give the Requester

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

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

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

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

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

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

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

Secure Your Tax Records From Identity Theft

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

To reduce your risk:

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

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

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

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

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

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

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

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

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

Privacy Act Notice

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

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

SAMPLE

FORM CIQ

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

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

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

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

OFFICE USE ONLY

Date Received

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

Company/Independent Contractor's Name

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

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

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

Name of Officer

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

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

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

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

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

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

If a relationship exists, please describe it here

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

7 **Signature**

Signature of vendor doing business with the governmental entity

Date

Date

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

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

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

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

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

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

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

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

***

(2) the vendor:

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

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

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

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

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

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

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

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

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

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

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

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

(1) the date that the vendor:

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

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

(2) the date the vendor becomes aware:

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

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

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

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

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

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

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

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

OFFICE USE ONLY

Date Received

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

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

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

_____

Name of Officer

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

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

☐ Yes ☐ No

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

☐ Yes ☐ No

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

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

7

_____ _____

Signature of vendor doing business with the governmental entity Date

CERTIFICATE OF INTERESTED PARTIES FORM 1295

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

GPISD is required to comply with House Bill 1295, which amended the Texas Government Code by adding Section 2252.908, Disclosure of Interested Parties. Section 2252.908 prohibits GPISD from entering into a contract resulting from this solicitation with a business entity unless the business entity submits a Disclosure of Interested Parties (Form 1295) to GPISD at the time business entity submits the signed contract. Effective January 1, 2018, the Form 1295 requirement does not apply to: (1) a contract with a publicly traded business entity or wholly owned subsidiary of the same; (2) an electric utility; or (3) a gas utility. The Texas Ethics Commission has adopted rules requiring the business entity to file Form 1295 electronically with the Texas Ethics Commission. The following definitions apply:

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

"Interested Party" means a person who has a controlling interest in a business entity with whom GPISD contracts or who actively participates in facilitating the contract or negotiating the terms of the contract, including a broker, intermediary, adviser, or attorney for the business entity. TEX. GOV'T CODE § 2252.908(3).

"Controlling interest" means an Districtship interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members; or service as an officer of a business entity that has four or fewer officers, or service as one of the four officers most highly compensated by a business entity that has more than four officers. *Subsection (c) does not apply to an officer of a publicly held business entity or its wholly owned subsidiaries.* TEX. ETHICS COMM. RULE 46.3(c).

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

As a "business entity," unless an exception applies, Vendors must:

1. Complete Form 1295 electronically with the Texas Ethics Commission using the online filing application, which can be found at **https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm**
    a. All Vendors must complete Form 1295, even if no interested parties exist, unless Vendor is a publicly traded business entity or wholly owned subsidiary of the same, an electric utility or a gas utility.
    b. In Section 2, insert "Galena Park Independent School District"
    c. In Section 3, insert the GPISD RFP/RFQ # for this proposal
2. Print a copy of the completed form (make sure that it has a computer-generated certification number in the "Office Use Only" box);
3. Have an authorized agent of the business entity sign the form; and
4. Submit the completed, signed Form 1295 by attaching the form to your proposal.

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

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

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

OFFICE USE ONLY

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

Business Company Name

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

Galena Park ISD

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

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

4

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

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

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

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

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

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

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

ADD ADDITIONAL PAGES AS NECESSARY

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

STATE AND FEDERAL CERTIFICATION FORM

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

CERTIFICATION REGARDING TERRORIST ORGANIZATIONS & BOYCOTTING OF ISRAEL

Vendor hereby certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State. Vendor further certifies and verifies that neither Vendor, nor any affiliate, subsidiary, or parent company of Vendor, if any (the "Vendor Companies"), boycotts Israel, and Vendor agrees that Vendor and Vendor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT BOYCOTT ENERGY COMPANIES

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it does not, and will not for the duration of the contract, boycott energy companies. "Boycott energy company" means, without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company: (A) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; or (B) does business with a company described by Paragraph (A). *[Verification does not apply to a vendor that employs less than 10 full-time employees; **AND** the value of the contract is less than $100,000 – Note that the term "company" does not include a sole proprietorship.]*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Pursuant to Federal Rule (H) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation by any federal department or agency.

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

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

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

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

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

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

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

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

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

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

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

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

RECORD RETENTION REQUIREMENTS FOR CONTRACTS INVOLVING FEDERAL FUNDS

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

CERTIFICATION OF COMPLIANCE WITH THE ENERGY POLICY AND CONSERVATION ACT

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

CERTIFICATION OF EQUAL EMPLOYMENT STATEMENT

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

CERTIFICATION OF COMPLIANCE WITH BUY AMERICA PROVISIONS

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

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

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

CERTIFICATION OF APPLICABILITY TO SUBCONTRACTRS

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

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

Vendor's Name: _____

Address, City, State, and Zip Code: _____

Phone Number: _____ Fax Number: _____

Printed Name and Title of Authorized Representative: _____

Email Address: _____

Signature of Authorized Representative: _____

Date: _____

CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION

THIS FORM MUST BE COMPLETED BY ALL SERVICE PROVIDERS

Section 1

Vendor (Name): _____

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

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

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

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

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

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

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

Section 2

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

_____ _____ _____

Signature of Vendor Print Name Date

Section 3

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

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

OR

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

_____ _____ _____

Signature of Vendor Print Name Date

GALENA PARK INDEPENDENT SCHOOL DISTRICT

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

Cimarron Elementary School Replacement

B101

CSP # 25-604

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

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

Agreement made as of January 12, 2026, between the Board of Trustees of the Galena Park Independent School District, hereinafter called the Owner,

and the Contractor:	**[INSERT CONTRACTOR NAME]** **[INSERT CONTRACTOR ADDRESS]**
Project:	**Cimarron Elementary School Replacement**
Address:	**816 Cimarron St. Houston TX 77015**
Project #:	**B101**
The Architect/Engineer is:	**S Chu Architects, Inc.** **1300 W. Sam Houston Parkway S. Suite 121 Houston, TX 77042**

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

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

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

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

(ACCEPTED ALTERNATES WILL BE LISTED HERE)

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

(UNIT PRICES WILL BE LISTED HERE)

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

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

Base Bid	**$**	
Graphics Allowance		**100,000**
Owner's Contingency Allowance		**750,000**
Written out in Dollars	**$**	

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

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

ATTEST: (Notary Seal)

By:

_____
(notary signature)

_____
(notary name printed) (notary expiration date)

CONTRACTOR
[INSERT CONTRACTOR NAME] Inc.

By: _____
(original signature)

_____
(name and title printed)

BOARD OF TRUSTEES GALENA PARK INDEPENDENT SCHOOL DISTRICT

By:

_____
Signature

_____
Print Name

_____
Title

CERTIFICATE OF APPROVAL

I hereby certify that pursuant to procedures authorized by the Board of Trustees of the Galena Park Independent School District, the foregoing Agreement was approved the12 day of January in the year 2026, and that the person whose signature appears above is authorized to execute such Agreement on behalf of the Board.

INSTRUCTIONS FOR PERFORMANCE AND PAYMENT BONDS

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

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

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

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

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

PERFORMANCE BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we,

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

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

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

_____ Dollars

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

The conditions of this obligation are such that whereas the principal has by written agreement dated the 12 day of January in the year 2026, entered into a contract with the Owner for

Project:	**Cimarron Elementary School Replacement**
Address:	**816 Cimarron St. Houston TX 77015**
Project #:	**B101**

in accordance with the Contract Documents prepared by

The Architect/Engineer is:	**S Chu Architects, Inc.** **1300 W. Sam Houston Parkway S. Suite 121 Houston, TX 77042**

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

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

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

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

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

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

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

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

ATTEST: (Notary Seal)

By: _____
(notary signature)

_____
(notary name printed) (notary expiration date)

PRINCIPAL

By: _____
(original signature)

_____
(name and title printed)

SURETY'S

By: _____
(original signature)

_____
(name and title printed)

SURETY HOME OFFICE SERVICING AGENT

_____
(name)

_____
(title)

_____
(address)

_____

_____
(Telephone)

CERTIFICATION AS TO CORPORATE PRINCIPAL

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

(CORPORATE SEAL)

PAYMENT BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we

[INSERT CONTRACTOR NAME]
[INSERT CONTRACTOR ADDRESS]

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

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

_____ Dollars

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

The conditions of this obligation are such that where as the principal has by written agreement dated the 12 day of January in the year 2026, entered into a contract with the Owner for

Project:	**Cimarron Elementary School Replacement**
Address:	**816 Cimarron St. Houston TX 77015**
Project #:	**B101**

in accordance with the Contract Documents prepared by

The Architect/Engineer is:	**S Chu Architects, Inc.** **1300 W. Sam Houston Parkway S. Suite 121 Houston, TX 77042**

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

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

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

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

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

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

ATTEST: (Notary Seal)

By: _____
(notary signature)

_____
(notary name printed) (notary expiration date)

PRINCIPAL

By: _____
(original signature)

_____
(name and title printed)

SURETY'S

By: _____
(original signature)

_____
(name and title printed)

SURETY HOME OFFICE SERVICING AGENT

_____
(name)

_____
(title)

_____
(address)

_____

_____
(Telephone)

CERTIFICATION AS TO CORPORATE PRINCIPAL

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

(CORPORATE SEAL)

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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ARTICLE 1

CONTRACT DEFINITIONS

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

1.1 Contract Documents: The Contract Documents consist of the Advertisement for Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, fully executed Owner-Contractor Agreement, Performance Bond, Payment Bond, the Conditions of the Contract (General, Supplementary, Special and other Conditions), the Project Manual, the Drawings, Pre-Proposal Meeting Minutes, all Addenda issued prior to execution of the Contract, other documents listed in the Owner-Contractor Agreement, and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by the Owner and the Contractor, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect.

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

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

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

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

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

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

1.6 Project: All of the Work defined by the Contract Documents. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.7 Work: The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

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

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

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

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

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

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

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

1.15 The Specifications: That portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

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

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

ARTICLE 2

LAWS GOVERNING CONSTRUCTION

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 3

CONTRACT DOCUMENTS AND BONDS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 4

CONTRACT ADMINISTRATION

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

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

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

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

Conditions and stated elsewhere in the Contract Documents.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.5 Contract Termination:

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5

CONTRACT RESPONSIBILITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

5.7 Insurance

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

.1 This section shall govern the entire Contract.

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

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

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

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

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

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

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

Duration of the Project includes the time from the beginning of the Work on the Project until the Contractor's/person's Work on the Project has been completed and accepted by the governmental entity.

Persons providing services on the Project ("Subcontractor" in Texas Labor Code 406.096) include all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent Contractors, Subcontractors, leasing companies, motor carriers,

owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the Project.

Services include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. Services do not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all employees of the Contractor providing services on the Project for the duration of the Project.

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

If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, then the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

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

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

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

The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.

The Contractor shall post on each Project site a notice, in the text, form, and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

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

1. Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all of its employees providing services on the Project for the duration of the Project;
2. Provide to the Contractor, prior to that person beginning work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project for the duration of the Project;
3. Provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.
4. Obtain from each other person with whom it contracts, and provide to the Contractor:
    a. A certificate of coverage, prior to the other person beginning work on the Project; and
    b. A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
5. Retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;
6. Notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
7. Contractually require each person with whom it contracts to perform as required by items 1-6, with the certificates of coverage to be provided to the person for whom they are providing services.

By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project,

that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the Commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

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

The coverage requirement recited above does not apply to sole proprietors, partners, and corporate officers who are excluded from coverage in an insurance policy or certificate of authority to self-insure that is delivered, issued for delivery, or renewed on or after January 1, 1996. 28 TAC 110.110(i)

5.7.3 Commercial General Liability Insurance (Occurrence Basis Only)

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

5.7.3.2 Bodily injury and property damage:

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

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

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

5.7.5 Deletions and Exclusions

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

5.7.6 Umbrella Liability Insurance

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

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

5.7.7 Builder's Risk Insurance:

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

.1 The policy shall be written in the name of the Owner and Contractor as their interest may appear.

.2 The policy shall be written on all risk basis for physical loss or damage and include the vandalism, malicious mischief.

.3 The amount of coverage shall be for the full insurable value of Work.

.4 The deductible shall not be over $1,000.00 without approval of the Owner. (Deductible losses shall be paid by the Contractor.)

.5 The policy shall include an endorsement allowing Owner occupancy, and the insurance shall not be canceled or altered on account of partial occupancy prior to completion.

.6 The original Builder's Risk Policy shall be furnished to the Owner prior to start of the job. This shall be a "Stand Alone" Policy.

.7 The Policy shall include $500,000 extra expense.

5.8 Safety Precautions and Emergencies:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5.14 Technical Submittals:

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

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

5.14.1.2Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

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

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

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

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

maintenance instructions, etc.

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

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

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

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

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

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

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

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

ARTICLE 6

CONTRACT CHANGES

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

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

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

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

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

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

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

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

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

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

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

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

6.3 Claims for Additional Costs:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 7

CONTRACT PAYMENTS

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

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

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

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

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

2251.021 Time for Payment by Governmental Entity.

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

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

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

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

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

2251.022 Time for Payment by Vendor

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

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

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

2251.023 Time for Payment by Subcontractor

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

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

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

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

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

7.2.2.2 Any request for reduction or release of retainage

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

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

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

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

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

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

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

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

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

7.3 Claims for Unpaid Labor and Materials:

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

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

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

ARTICLE 8

CONTRACT COMPLETION TIME

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

8.2 Construction Schedule:

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

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

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

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

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

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

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

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

8.3 Delays and Extension of Time:

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

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

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

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

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

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

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

work days)

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

8.3.2.5 Inclement Weather Days shall pertain to such items as rain, flooding, snow, unusually high winds, which prevent progress on major portions of the Work on regular work days only. If such situations occur on more than the Number of Anticipated Inclement Weather Days included in the Proposed Contract Time and if those additional days prevent the Contractor from performing critical portions of the scheduled Work, then time extensions caused by inclement weather may be requested as enumerated hereinafter. If the inclement weather is rain related, then the rain at the site must have been in excess of 0.50 inch in 24 hours.

8.3.2.6 At the beginning of each month the Contractor shall submit a schedule showing 1) the scheduled number of Anticipated Inclement Weather Days for the particular month, 2) the Actual Inclement Weather Days requested, and 3) the Net Inclement Weather Days (plus, minus, or no change). At times deemed appropriate by the Architect, the Contract Time will be adjusted by Change Order if the total of Net Inclement Weather Days is substantially greater than 0. If at the end of the Project all Anticipated Inclement Weather Days have not been used, then the Contract Time will not be reduced. An example of the monthly schedule to be submitted is as follows:

Month	Anticipated Inclement Weather Days(Regular)	Actual Inclement Weather Days (Regular) Requested	Net Inclement Weather Days(Regular)
January	3	8	5
February	4	0	-4
March	4	2	-2
April	2	2	0
May	5	7	2
June	6	10	4
TOTAL	24	29	5

Using this example, there were five (5) Net Inclement Weather Days (regular) for the first six (6) months of the Project and the extension of Contract Time would be seven (7) calendar days (since a seven (7) calendar days extension is granted after five (5) Regular Work Days are lost).

8.3.3 The Contractor shall have no claim for compensation or damages due to delays in, or hindrances to, the Work and further agrees that the Contractor shall be fully compensated for all delays solely by a time extension.

8.3.4 No time extension shall release the Contractor or the Surety furnishing a performance or payment bond from all obligations thereunder; which obligations shall remain in full force until the discharge of the Contract.

8.3.5 No time extensions will be allowed for any of the following conditions:

8.3.5.1 At least seven (7) hours of available work time out of the work day.

8.3.5.2 Saturdays, Sundays or Holidays unless the Contract requires and stipulates overtime work.

8.3.5.3 Time required for drying of materials when it is possible for the Contractor to enclose the area and use drying devices.

8.3.6 The Contractor shall maintain a Project log indicating all time in excess of one (1) hour for which work was suspended during a work day in order to obtain any time extension.

8.3.7 The Contractor shall obtain approval from the Owner for work during the following times:

8.3.7.1 Saturdays, Sundays or Holidays.

8.3.7.2 Prior to 7:00 am and after 7:00 pm on scheduled work days.

8.4 Completion of Work: The Contractor will be held to account for the Work being completed in the Contract Time, or any extension thereof.

8.4.1 If, in the judgment of the Owner, the Work is behind schedule and the rate of placement of Work is inadequate to regain scheduled progress so as to insure timely completion of the entire Work or a separable portion thereof, then the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of Work placement. This increase shall be accomplished by any one or a combination of the following or other suitable measures:

.1 An increase in Work forces.
.2 An increase in equipment or tools.
.3 An increase in hours of work or number of shifts.
.4 Expediting delivery of materials.

8.4.2 The Contractor shall, within ten (10) calendar days after being so informed, notify the Owner of the specific measures taken and/or planned to increase the

rate of progress together with an estimate as to when scheduled progress will be regained. Should the plan of action be deemed inadequate by the Owner, the Contractor shall take additional steps or make adjustments as necessary to the plan of action until it meets with the Owner's approval. The increased rate of work will continue until scheduled progress is regained. Scheduled progress will be established from the latest revised and accepted progress schedule for the Project. Timely completion will be understood to be the Contract completion date as revised by all time extensions granted at the time acceleration is undertaken. The Contractor shall not be entitled to additional compensation for the additional effort applied to the Work under the terms of this Subparagraph.

8.5 Failure to Complete Work on Time: The time set forth in the Supplementary Conditions of the Contract for Construction for the completion of all Work is an essential element of the Contract. Contractor's failure to complete the Work within such time will cause damage to the Owner. The value of such damages shall be stated in the Supplementary Conditions of the Contract for Construction.

8.5.1 The time specified for completion in the Supplementary Conditions of the Contract for Construction shall cover final cleanup of the premises and completion of punch list deficiencies.

8.5.2 For each consecutive calendar day after the expiration of the Contract Time that any Work (including the correction of deficiencies found during the Final Inspection) is not completed and accepted, the amount per day as stipulated in the Supplementary Conditions of the Contract for Construction will be deducted from the money due or to become due the Contractor, not as a penalty but as liquidated damages and added expense for Contract supervision and Owner's delay costs in obtaining the use of the Work.

ARTICLE 9

CONTRACT SUBSTANTIAL COMPLETION

9.1 Certification: Should the Owner wish to use or occupy the Project, or part thereof, prior to final completion, and the Project, or a designated portion thereof acceptable to the Owner, is substantially complete, the Contractor shall prepare for and submit to the Architect/Engineer a comprehensive list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Owner and Architect/Engineer on the basis of a Pre-Final Inspection determine that the Project or designated portion thereof is substantially complete, the Architect/Engineer will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion; shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, operation of permanent equipment, damage to the Work, and insurance; and shall fix the time within which the Contractor shall complete all items on the list accompanying the Certificate.

9.1.1 Prior to the Pre-Final Inspection, and as a prerequisite to issuance of a Certificate of Substantial Completion, the Contractor shall furnish to the Owner all Record Documents, instructional manuals, maintenance manuals, parts catalogs, wiring diagrams, operational manuals, maintenance material stocks, spare parts and tools, specified written warranties, guarantees and like publications or parts for all installed equipment, systems and like items required by the Contract Documents; and shall conduct all instruction of the Owner's personnel required by the Contract Documents. If the Contractor does not furnish these requirements and the Owner must, out of necessity, obtain these materials, instructions, information and data, then the cost for this procurement will be deducted from the monies due the Contractor.

9.1.2 If the Owner must take occupancy of the Project due to compliance with State laws and the Project is not substantially complete, then the Contractor shall purchase extended warranties on equipment which must be in operation for the Owner to take occupancy.

9.2 Date of Substantial Completion: The Date of Substantial Completion of the Project, or designated portion thereof, is the date jointly certified by the Architect/Engineer, Owner and Contractor when construction is Substantially Complete as herein before defined.

9.3 Additional Inspection Costs: The Contractor shall be charged by the Owner for any costs of re-inspection resulting from substantial differences between the Contractor's list of items to be completed or corrected and the list of items resulting from the Pre-Final Inspection.

ARTICLE 10

CONTRACT FINAL ACCEPTANCE AND PAYMENT

10.1 Notification: When the Project is completed, the Contractor shall notify the Owner in writing that the Project will be ready for Final Inspection on a definite date. Upon verification by the Contractor that the Project

is ready for Final Inspection and acceptance, the Architect/Engineer and the Owner will within ten (10) calendar days make a Final Inspection and, when the Project is found acceptable under the Contract Documents and the Contract is fully performed, make final payment to the Contractor.

10.2 Final Payment Documentation: Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect/Engineer for transmittal to the Owner:

.1 Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706
.2 Contractor's Affidavit of Release of Liens, AIA Document G706A
.3 Contractor's, Subcontractor's, Sub-subcontractor's, and Supplier's separate releases on the prescribed forms.
.4 Consent of Surety to Final Payment, AIA Document G707 (if applicable).
.5 Final list of Subcontractors and Sub-subcontractors, AIA Document G805.
.6 The Contractor and each and every Subcontractor, Sub-subcontractor and Supplier shall provide a"Certificate of No Asbestos, PCB and Lead". *The form used shall be the attached form on Page 28 of these General Conditions.* For the purpose of definition as used in this form, the term "potable water systems" includes, but is not limited to, those water systems for drinking fountains, all sinks and lavatories, showers, bath tubs, residential and commercial kitchen equipment, icemakers, and hose bibbs, as applicable to this specific Project.
.7 Material Safety Data Sheets: Effective September 1, 2000, the Texas Department of Health implemented a new rule in the AHERA Regulation which requires that Material Safety Data Sheets be provided to the Owner by the Contractor on the materials incorporated into the Work which but not limited to the list below (not all of which may have been used in this specific Project):
  .1 Floor Tiles
  .2 Sheet Floorings
  .3 Adhesives (Mastics)
  .4 Suspended Ceiling Tiles
  .5 Glued-on/Nailed-on Ceiling Tiles
  .6 Gypsum Board
  .7 Blown-in Insulation
  .8 Batt/Roll Insulation
  .9 Gaskets
  .10 Sprayed-on/Troweled-on Surfacing Materials
  .11 Pipe Insulation
  .12 Pipe Fitting Insulation
  .13 Boiler Insulation
  .14 Flue Insulation (Vent Pipe Insulation)
  .15 Heating/AC Ducting
  .16 Air Handler Cloth Joint (Flex Joint)
  .17 Air Handler Insulation

If Material Safety Data Sheets are not provided by the Contractor, then the Contractor shall be responsible for obtaining samples of the materials listed above and the required testing of the samples at no additional cost to the Owner. These Material Safety Data Sheets shall be included in the maintenance and instruction manuals.

10.3 Final Payment:

10.3.1 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

.1 Faulty or defective Work appearing after Substantial Completion;
.2 Failure of the Work to comply with the requirements of the Contract Documents; or
.3 Terms of any special warranties required by the Contract Documents.

10.3.2 Acceptance of final payment shall constitute a waiver of all claims by the Contractor except those specifically enumerated at the time of final payment.

ARTICLE 11

CONTRACT CORRECTION PERIOD

11.1 One Year Contract Correction Period: Except as otherwise specified, the Contractor warrants and guarantees all Work against defects in materials, equipment or workmanship. For one (1) year from the date of Substantial Completion of the entire Project or designated portions thereof, the Contractor shall undertake correction, repair or replacement of any defective of non-conforming work.

11.2 Remedy of Defects Under Warranty: Upon receipt of written notice from the Owner of the discovery of any defects, the Contractor shall remedy the defects and replace any property damaged therefrom occurring within the contract correction period. If the Contractor, after notice, fails to proceed and remedy such defects within five (5) days or within any other period of time which has been agreed in writing, or to comply with the terms of the warranty and guarantee, then the Owner may have the defects corrected and the Contractor and the Contractor's Surety shall be liable for all expenses incurred. If the defect needs immediate correction, e.g., A/C system fails causing possible dismissal of school, then the Owner will contact the Contractor, Subcontractor, Sub-subcontractor, or manufacturer (whichever applies), advise them of the defect and make repairs. An itemized list of labor and materials with

certified payrolls and material invoices will be forwarded to the Contractor for payment.

ARTICLE 12

OPERATION AND STORAGE AREAS

12.1 Contractor's Use of Premises: The Contractor will operate and maintain operations areas and associated storage areas at the Project site in accordance with the following:

12.1.1 All Contractor operations, including storage of materials and employee parking upon the Project site, shall be confined to areas designated by the Owner.

12.1.2 The Contractor may erect temporary buildings at its expense, which shall remain its property. The Contractor shall remove such buildings and associated utilities service lines upon completion of the Project, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.

12.1.3 The Contractor will use only established roadways, or construct and use such temporary roadways as may be authorized by the Owner. Load limits of vehicles shall not exceed the limits prescribed by appropriate regulations or law. The Contractor will provide protection to existing and new road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler systems, drainage structures and other like existing and new improvements to prevent damage. Any damage thereto shall be repaired by, and at the expense of, the Contractor.

12.1.4 The Owner may restrict the Contractor's entry to the Project site to specifically assigned entrances and routes.

12.2 Contractor's Maintenance of Premises: The Contractor shall at all times keep the Project site free from the accumulation of waste, waste materials, rubbish, or construction debris during performance of Work.

12.2.1 During the period of construction, and not less frequently than once a week, the Contractor shall remove from the Project site any and all waste materials, rubbish, construction debris and trash; and shall dispose of such waste materials, rubbish, construction debris and trash off the property of the Owner. The Contractor shall mow and trim the grass within the Project site at least every other week throughout the entire Contract Time.

Prior to the Contractor's requested date for a Pre-Final Inspection, the Contractor shall remove any and all remaining equipment from the Project site and shall leave the premises in a clean, neat and workmanlike condition satisfactory to the Owner.

Prevailing Wage Rate
Determination Information

The following information is from Chapter 2258 Texas Government Code:

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

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

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

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

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

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

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

Prevailing Wage Rates – School Construction Trades

June 2, 2025

Texas Gulf Coast Area

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

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

Prevailing Wage Rates

Worker Classification Definition Sheet

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

ARTICLE 3 – CONTRACT DOCUMENTS AND BONDS

Copies Furnished: Drawings and the Project Manual: The Contractor will be furnished free of charge **three (3) sets** of the Drawings and Project Manual. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 4 – CONTRACT ADMINISTRATION

Subcontracts:

The Contractor shall contract only with subcontractors for the Mechanical, Plumbing, Electrical, Security, Fire Alarm and P.A. Systems per the following: None

ARTICLE 5 – CONTRACT RESPONSIBILITIES:

The existing site and buildings are considered in good condition. The selected contractor shall document through the use of video or camera media any existing defects (including, but not limited to, staging and site work areas) prior to the start of any construction. Copies of the videotapes or photographs must be filed with the Architect and Owner prior to the start of any construction. Any and all defects not specifically identified prior to construction shall be repaired/replaced to the satisfaction of the Owner at no additional cost to the Owner.

ARTICLE 8 – CONTRACT COMPLETION TIME:

8.1 Notice to Proceed: Add the following: The following Schedule is for approval and execution of the Standard Form of Agreement between Owner and Contractor. These dates are planned and subject to changes. GPISD will make every attempt to maintain the schedule; however, if revisions are required to activities controlled by the Owner which delay the issuance of the "Notice to Proceed: then the Date of Substantial Completion will be revised by maintaining the same durations for construction.

Activity	Responsibility	Dates
.1 Prepare and forward to Contractor	Owner	January 13, 2026
.2 Contractor execution	Contractor	January 13, 2026
.3 Board of Trustees Approval and Execution	Owner	January 12, 2026
.4 Contractor obtain bonds & Insurance	Contractor	January 19, 2026
.5 Issue "Notice to Proceed"	Owner	January 26, 2026
.6 Date of Substantial Completion	Contractor	Building: March 1, 2027 Demo: June 28, 2027

Liquidated Damages: Add the following: Time is of the essence of this Contract. Contractor acknowledges and agrees that its failure to complete the Work within the Contract Time shall cause damage to the Owner, and further agrees that the amount of such damage cannot be accurately measured or is difficult to ascertain. Therefore, Contractor agrees that for each and every calendar day the Work or any portion thereof shall remain uncompleted after the expiration of the Contract Time Contractor shall pay to Owner

as Liquidated Damages in the sum of $1,000 per calendar day after substantial completion. Owner shall have the right to withhold and deduct the amount of any or all such damages from any moneys owned to the Contractor.

CC - SPECIAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following are special conditions of the Galena Park Independent School District Contract for Construction.

SCHOOL SCHEDULE

The Owner currently plans the following school operations on or near the site of the Work during the Contract Time:

1. Full school operations will be conducted at the school during the normal school year. During the summer vacation, limited school operations will be conducted.
2. The Contractor shall not perform any work during the week of the STAAR and/or EOC testing. Refer to the attached schedule.
3. When school is in session, if the Contractor is going to work during time periods listed below, then the Contractor will include in its Base Proposal the cost of a GPISD employee at the rate of $50.00 per hour to operate the security system and provide access to the facility.
    a. Prior to 7:00 AM, after 11:00 PM.
    b. Weekends - refer to attached schedule.
    c. Holidays - refer to attached schedule
4. The Contractor shall recognize the critical need for safety of all persons involved in the school program, and the need to conduct construction operations in such a way as to minimize disruption of school program operation. Contractor understands that it is the obligation of the Contractor to protect the Work, materials and equipment from vandalism and theft, and that it cannot rely on school security personnel to perform this function.
5. Critical areas and systems including, but not limited to, air conditioning system, electrical system and kitchen must remain functional at all times while the school is in operation. Any renovation work that would require a shut down of these items must be accomplished during vacations, holidays, or at other times when the school is not operating.

CRIMINAL HISTORY

If Contractor does not have access to the criminal history records of employees who will work at the Sites, Contractor shall ensure such employees cooperate and submit all information necessary for District's LEE Fast Pass procedure.

2025 | 26 SCHOOL CALENDAR

July 2025

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

August 2025

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October 2025

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November 2025

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

December 2025

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

January 2026

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2026

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March 2026

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April 2026

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May 2026

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June 2026

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Important Dates

August 12 — First Day of School
May 22 — Last Day of School

New Teacher Orientation

July 29 - August 1

Student Holiday/Staff Development

August 4 - 11, 29
October 14
January 5
March 6
September 19
November 3, 4
February 13
April 2

Early Dismissal All Campuses

December 19
May 22

Holidays

July 4
October 10 - 13
Dec. 22 - Jan. 2
February 16
April 3 - 6
June 19
September 1
November 24 - 28
January 19
March 9 - 13
May 25

LEGEND

- Student Holiday/Staff Development
- District Holidays
- School Holidays, except for EOC Testing
- New Teacher Orientation
- Early Dismissal - All Campuses

SCHOOL HOURS

Elementary School	7:35 am - 3:15 pm
Middle School	8:20 am - 4:00 pm
High School	7:05 am - 2:45 pm
Early College High School	8:00 am - 4:15 pm
Zotz Education Center	8:15 am - 3:55 pm

Six Weeks Grading Period

High Schools

First Semester		Report Card Dates
1. Aug. 12 - Sept. 18	(26 days)	Sept. 26
2. Sept. 22 - Oct. 31	(27 days)	Nov. 7
3. Nov. 5 - Dec. 19	(28 days)	Jan. 9
Second Semester		
4. Jan. 6 - Feb. 12	(27 days)	Feb. 20
5. Feb. 17 - Apr. 1	(26 days)	Apr. 10
6. Apr. 7 - May 22	(34 days)	June 4

Nine Weeks Grading Period

Elementary/Middle Schools

First Semester		Report Card Dates
1. Aug. 12 - Oct. 9	(39 days)	Oct. 17
2. Oct. 15 - Dec. 19	(42 days)	Jan. 9
Second Semester		
3. Jan. 6 - Mar. 5	(40 days)	Mar. 20
4. Mar. 16 - May 22	(47 days)	May 26 ES/May 29 MS

State Testing Days

December 2 - 12	End of Course Testing
April 7 - April 24	STAAR/End of Course
May 4 - May 15	Dual Credit Finals/AP Testing
June 17 - 20	STAAR/End of Course Retest

(Subject to change if needed)

Galena Park Independent School District

14705 Woodforest Blvd. * Houston, Texas 77015 * 832-386-1000 * www.galenaparkisd.com

01/27/2025

Project Manual

for

Cimarron Elementary School Replacement

Galena Park Independent School District

VOL 1I (DIV. 1-14)

Date: Oct. 24, 2025

Project No.: 2502 (GPISD B101-101)

Issue for CSP

S. Chu Architects, Inc.

281 / 961-0355

Project Manual

for

Cimarron Elementary School Replacement

Galena Park Independent School District

VOL II (DIV. 1-14)

Oct. 24, 2025
Project No.: 2502(B101-101)

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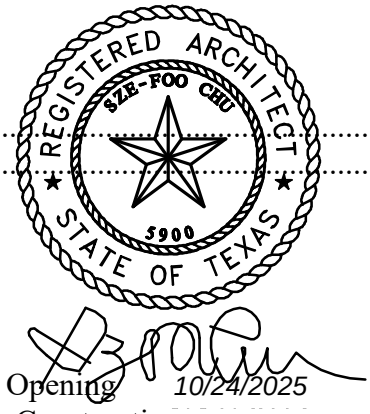
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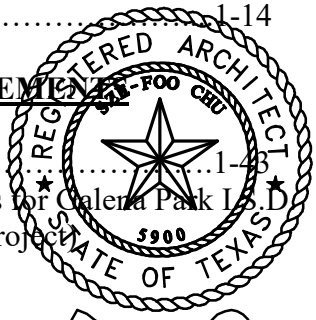
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10/24/2025

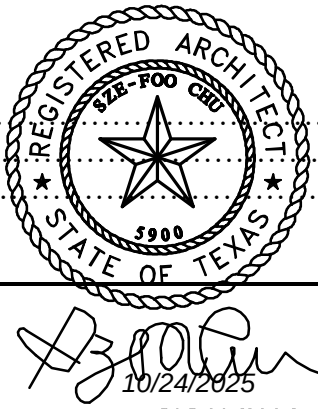
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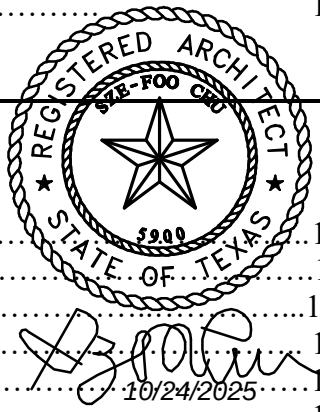
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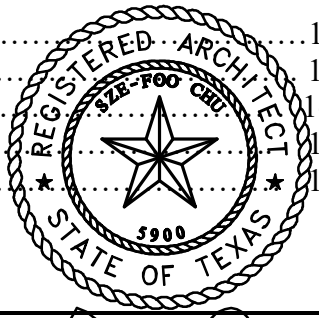
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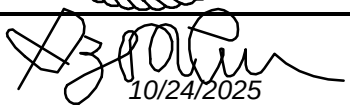
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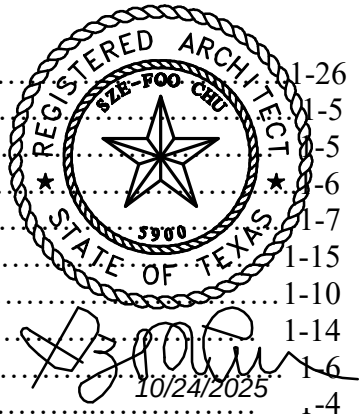
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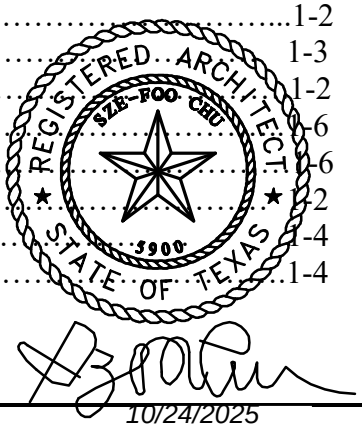
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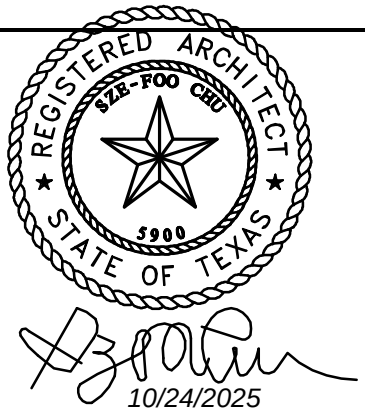


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E5.22	Electrical & Low Voltage Device Details
E5.30	Telecom Grounding Riser & Details
E5.31	Telecom Backbone & Conduit Riser
E5.32	Structural Cabling Details
E5.33	Structural Cabling Device Details
E5.40	Sound System Riser & Details
E5.41	Sound System Riser & Details
E5.42	Sound System Riser and Details
E5.50	Security and Access Control Details
E5.51	Security and Access Control Details
E6.00	Light Fixture Schedule
E6.01	Light Fixture Schedule & Sequence of Operations
E6.10	Light Details
E7.01	Electrical Coordination Plan- 1st Floor
E7.02	Electrical Coordination Plan- 1st Floor
E7.03	Electrical Coordination Plan- 1st Floor
E7.11	Enlarged Electrical Plan- 1st Floor
E7.12	Enlarged Electrical Plan- 2nd Floor



PLUMBING

P1.01	Plumbing 1st Floor Plan- Area "A"
P1.02	Plumbing 2nd Floor Plan- Area "A"
P1.03	Plumbing Floor Plan Area "B"
P1.03K	Enlarged Kitchen Plan
P1.04	Plumbing Floor Plan Area "C"

P1.05	Plumbing 2nd Floor Plan Area “C”
P3.00	Plumbing Schedules
P4.00	Plumbing Details and Schedules
P4.01	Plumbing Details
P5.00	Plumbing Riser Diagrams Area “A”
P5.01	Plumbing Riser Diagrams Area “B”
P5.02	Plumbing Riser Diagrams Area “C”
P6.00	Plumbing Storm Riser Diagrams



SECTION 00 3132

GEOTECHNICAL REPORTS

I. APPLICABILITY

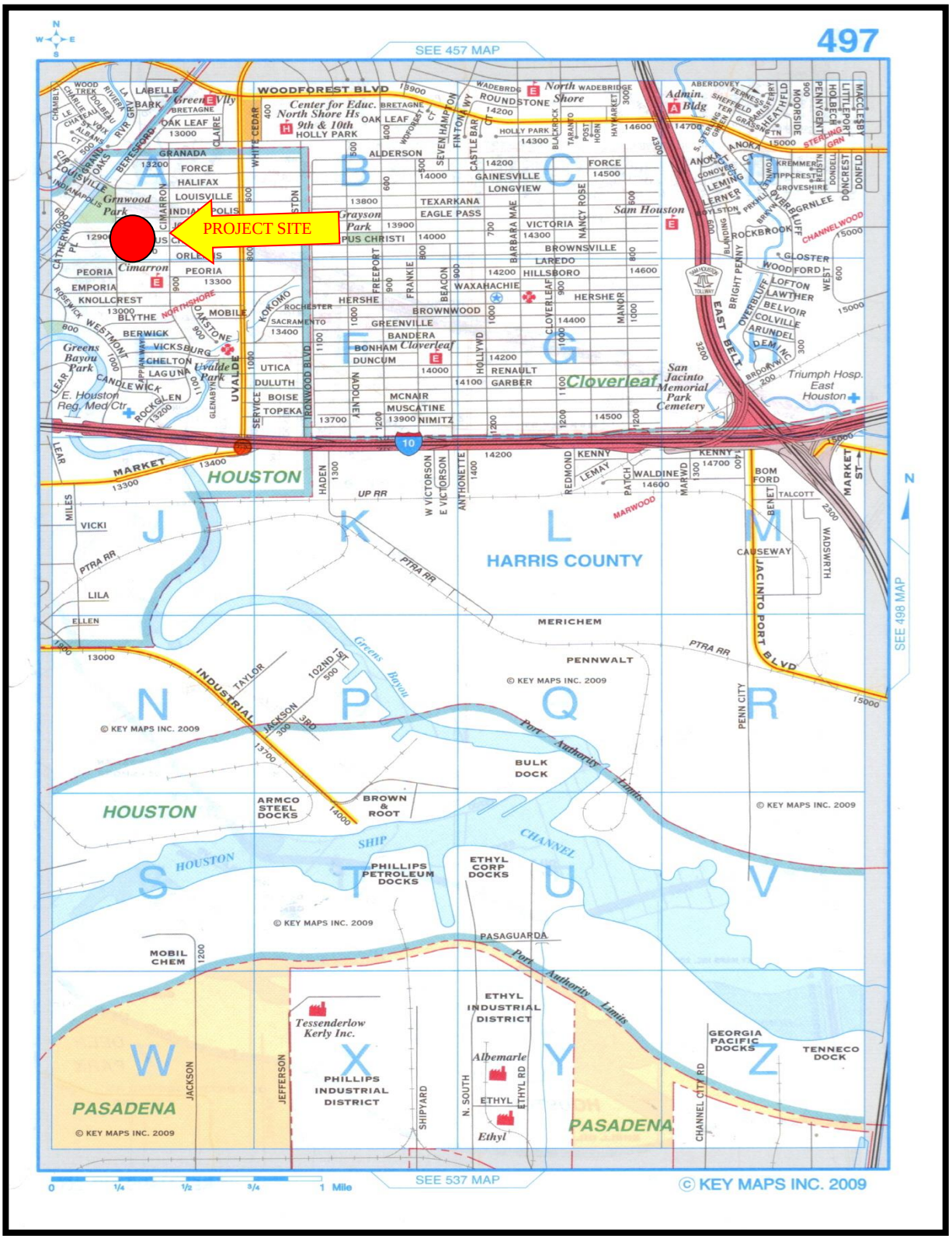
A. Boring Logs are provided for proproser's general information only. The Architect and Owner shall not be held responsible for accuracy of data.

B. Proprosers 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. Such investigations shall be performed only under the time schedules and arrangement approved in advance by the Architect.

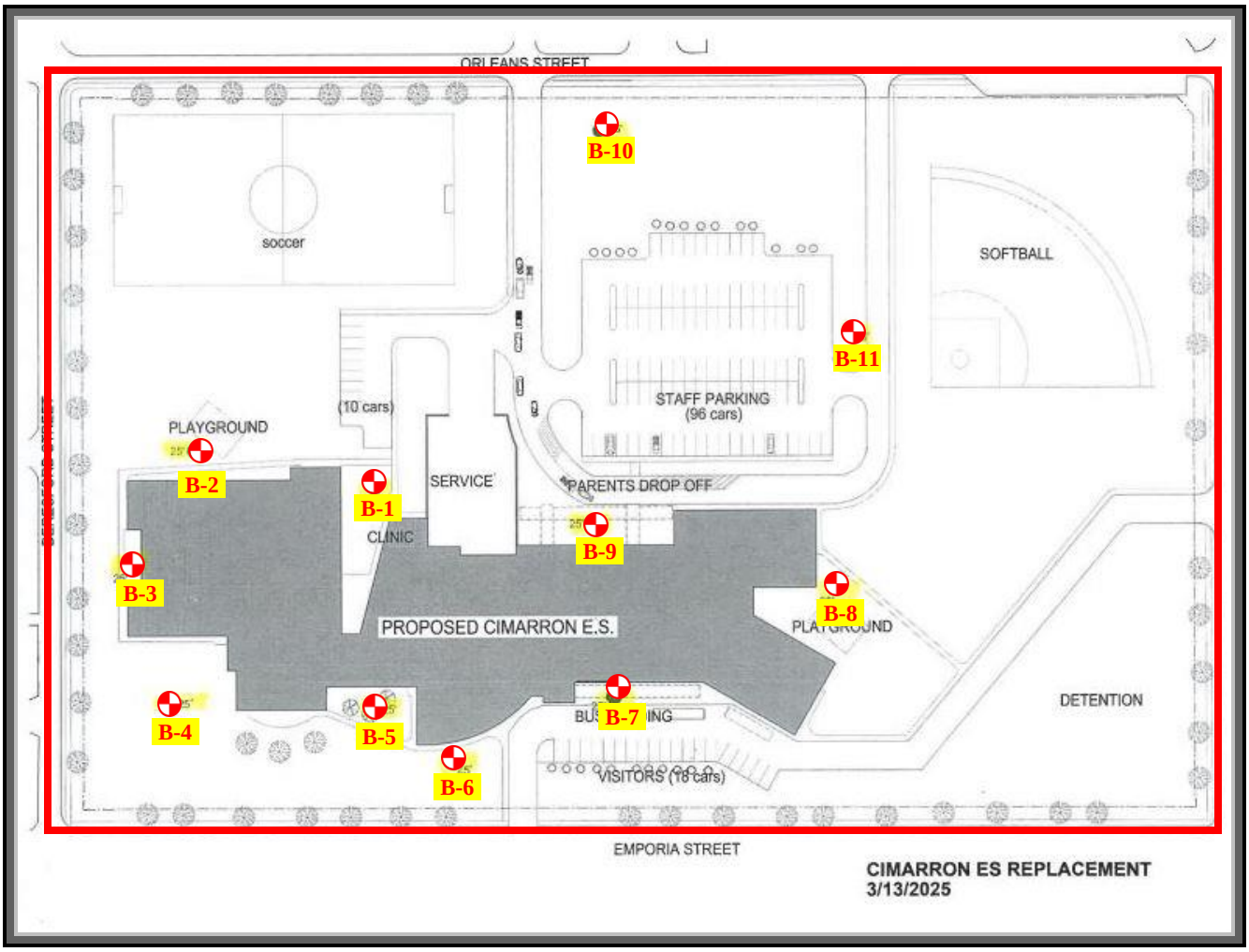
C. No additional amount will be made available to the successful proposer for work arising from failure to examine site or subsoil conditions.

D. The geotechnical reports are not part of the Contract Documents.

END OF SECTION



SITE VICINITY MAP		NORTH
PROJECT: G/S for Proposed Building, Paving, and Underground Utilities for Proposed Cimarron Elementary School Replacement Harris County, Texas		
SCALE: NOT TO SCALE	DATE: APRIL 2025	PROJECT NO.: 25-283E

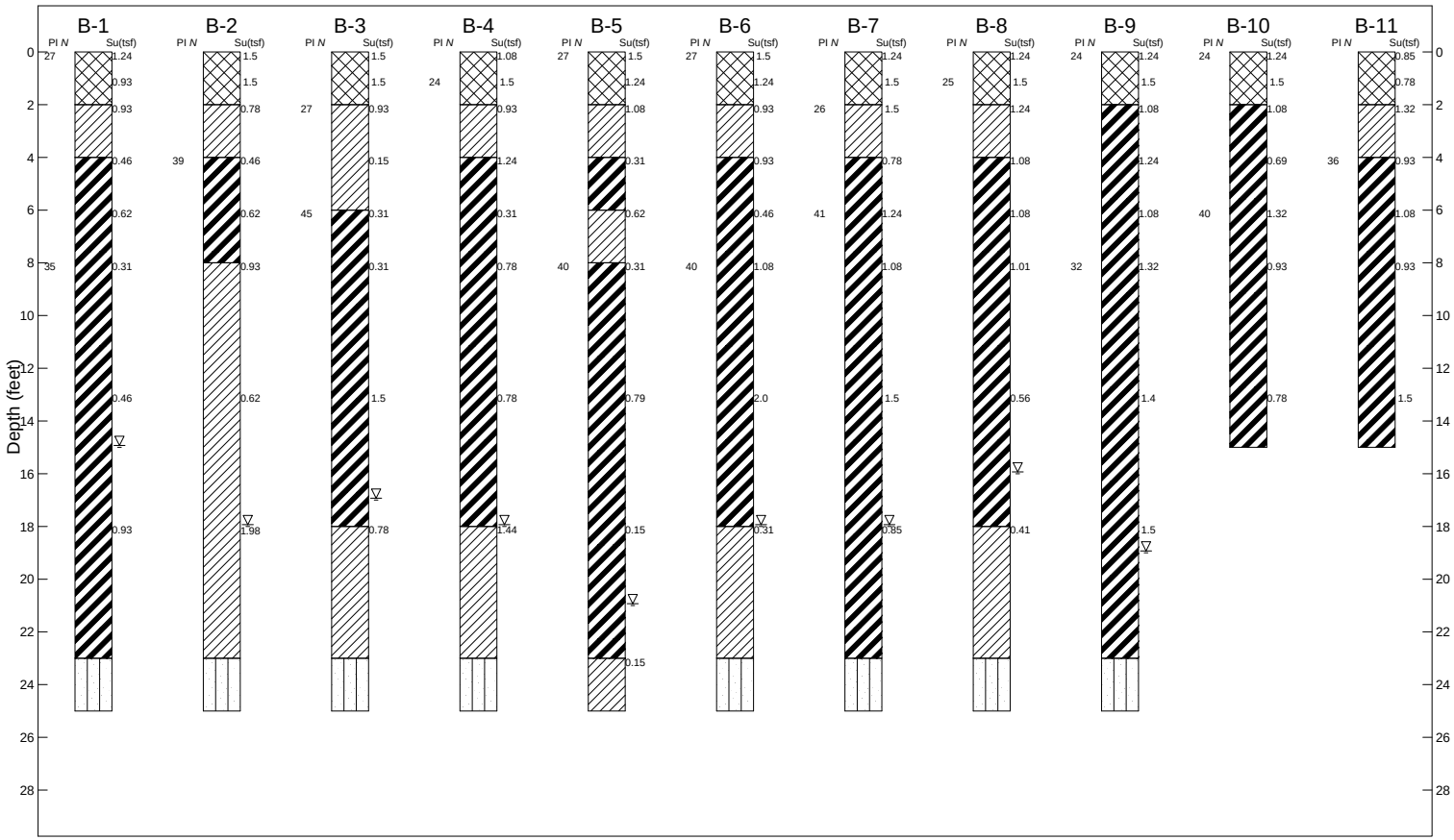


SITE PLAN

NORTH

PROJECT: G/S for Proposed Building, Paving, and Underground Utilities for Proposed Cimarron Elementary School Replacement
Harris County, Texas

SCALE: NOT TO SCALE	DATE: APRIL 2025	PROJECT NO.: 25-283E



Lithology Graphics

Fill

Lean Clay (CL)

Fat Clay (CH)

Silty Sand (SM)

Explanation

B-1 — Borehole Number

Borehole Lithology

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396

G/S for Proposed Cimarron Elementary School, Galena ISD

Harris County, Texas

JOB NUMBER	PLATE NUMBER
25-283E	Plate 3

LOG OF BORING NO. B-1

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					ELEVATION: Existing Grade									
					FILL: LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers to 2', sand seams and layers	15	45	18	27					
					- stiff 1' to 2'									
					LEAN CLAY (CL), stiff, dark brown, brown, with root fibers to 4', sand seams and layers									
					FAT CLAY (CH), firm, dark brown, brown, with root fibers to 10'									
5					- stiff 6' to 8'									
					- light brown 8' to 20'									
						22	55	20	35					
10														
					- calcareous nodules 13' to 15'									
15														
					- stiff 18' to 20'									
20														
					SILTY SAND (SM), brown, light brown									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

- ▲ HAND PENETROMETER
- ▮ TORVANE
- ● UNCONFINED COMPRESSION
- ○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 15.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-2

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
					ELEVATION: Existing Grade									
0					FILL: LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers to 2', sand seams and layers, ferrous nodules									
					LEAN CLAY (CL), stiff, dark brown, brown, with root fibers to 4', sand seams and layers									
5					FAT CLAY (CH), firm, dark brown, brown, with root fibers to 8'	23	59	20	39					
					- stiff, light brown, ferrous nodules 6' to 8'									
					LEAN CLAY (CL), stiff, brown, light brown, with root fibers to 23', sand seams and layers, calcareous nodules									
10														
					- reddish brown 13' to 20'									
15														
					- very stiff, brown 18' to 20'	23						106		
20														
					SILTY SAND (SM), reddish brown, brown									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.

WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)

LOGGED BY: Joel

LOG OF BORING NO. B-3

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION ELEVATION: Existing Grade	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					FILL: LEAN CLAY (CL), very stiff, reddish brown, dark brown, with root fibers to 2', sand seams and layers, ferrous nodules									
					LEAN CLAY (CL), stiff, dark brown, brown, with root fibers to 4', sand seams and layers - soft 4' to 6'	20	45	18	27					
5					FAT CLAY (CH), firm, brown, light brown	23	66	21	45					
					- reddish brown 8' to 15'									
10														
					- very stiff, calcareous nodules 13' to 15'									
15														
					LEAN CLAY (CL), stiff, reddish brown, brown, sand seams and layers									
20														
					SILTY SAND (SM), brown, light brown									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 17.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-4

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	DESCRIPTION	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0	ELEVATION: Existing Grade									
0	FILL: LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers to 2', sand seams and layers, ferrous nodules	16	41	17	24					
4	LEAN CLAY (CL), stiff, dark brown, brown, with root fibers to 4', sand seams and layers									
5	FAT CLAY (CH), very stiff, dark brown, brown, with root fibers to 15'									
8	- firm, light brown 6' to 8', ferrous nodules 6' to 10'									
10	- stiff, calcareous nodules 8' to 15', reddish brown 13' to 15'									
18	LEAN CLAY (CL), very stiff, brown, light brown, sand seams and layers	25						101		
23	SILTY SAND (SM), brown, light brown									
25										
30										

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.

WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)

LOGGED BY: Joel

LOG OF BORING NO. B-5

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	DESCRIPTION ELEVATION: Existing Grade	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0	FILL: LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers to 2', sand seams and layers	16	45	18	27					
	LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers to 4', sand seams and layers									
5	FAT CLAY (CH), firm, dark brown, brown, with root fibers to 6'									
	LEAN CLAY (CL), stiff, dark brown, brown, with root fibers to 8'									
	FAT CLAY (CH), firm, brown, light brown, with root fibers to 20'	23	60	20	40					
10										
	- stiff 13' to 15'	21						106		
15										
	- soft 18' to 20'									
20	▽									
	LEAN CLAY (CL), soft, brown, light brown, sand seams and layers									
25										
30										

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 21.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-6

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION (ELEVATION: Existing Grade)	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					FILL: LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers to 2', sand seams and layers	16	45	18	27					
					LEAN CLAY (CL), stiff, dark brown, brown, with root fibers to 4', sand seams and layers									
5					FAT CLAY (CH), stiff, dark brown, brown, with root fibers to 15'									
					- firm 6' to 8', ferrous nodules 6' to 15'									
					- very stiff, reddish brown 8' to 10'	23	60	20	40					
10														
					- hard with calcareous nodules 13' to 15'	21						108		
15														
					LEAN CLAY (CL), firm, brown, light brown, sand seams and layers									
20														
					SILTY SAND (SM), brown, light brown									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.

WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)

LOGGED BY: Joel

LOG OF BORING NO. B-7

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					ELEVATION: Existing Grade									
					FILL: LEAN CLAY (CL), very stiff, dark brown, reddish brown, with root fibers to 2', sand seams and layers, gravels									
					LEAN CLAY (CL), stiff, dark brown, reddish brown, with root fibers to 4', sand seams and layers, gravels	20	44	18	26					
5					FAT CLAY (CH), stiff, dark brown, reddish brown, with root fibers to 15', gravels									
					- very stiff 6' to 15'	22	62	21	41					
10														
					- reddish brown, ferrous nodules 13' to 20', calcareous nodules 13' to 15'									
15														
20														
					SILTY SAND (SM), reddish brown, light brown, gravels									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

- ▲ HAND PENETROMETER
- ▮ TORVANE
- ● UNCONFINED COMPRESSION
- ○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 18.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-8

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION ELEVATION: Existing Grade	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					FILL: LEAN CLAY (CL), very stiff, dark brown, reddish brown, with root fibers to 2', sand seams and layers, gravels	18	43	18	25					
					LEAN CLAY (CL), very stiff, dark brown, reddish brown, with root fibers to 4', sand seams and layers, gravels									
5					FAT CLAY (CH), very stiff, dark brown, reddish brown, with root fibers to 15', gravels									
					- ferrous nodules 8' to 15'									
10					- light brown 13' to 15'									
15					LEAN CLAY (CL), firm, reddish brown, light brown, sand seams and layers, gravels	23						102		
20					SILTY SAND (SM), reddish brown, light brown, gravels									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 16.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-9

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 25.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION ELEVATION: Existing Grade	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					FILL: LEAN CLAY (CL), very stiff, dark brown, reddish brown, with root fibers to 2', sand seams and layers, gravels	16	42	18	24					
					FAT CLAY (CH), very stiff, dark brown, reddish brown, with root fibers to 10', gravels									
					- ferrous nodules 4' to 20'									
5														
					- light brown 8' to 20'									
						25	51	19	32					
10														
					- calcareous nodules 13' to 20'									
15														
20														
					SILTY SAND (SM), reddish brown, light brown, gravels									
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

▲ HAND PENETROMETER

▮ TORVANE

● UNCONFINED COMPRESSION

○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:

▽ : WATER ENCOUNTERED AT 19.0 ft. DURING DRILLING

DRY AUGER: 0 TO 25 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-10

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 15.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION ELEVATION: Existing Grade	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					FILL: LEAN CLAY (CL), very stiff, dark brown, reddish brown, with root fibers to 2', sand seams and layers, gravels	15	41	17	24					
					FAT CLAY (CH), very stiff, dark brown, reddish brown, with root fibers to 15', gravels - stiff 4' to 6'									
5					- ferrous nodules 6' to 15'	22	60	20	40					
					- stiff, light brown, calcareous nodules 8' to 15'									
10														
15														
20														
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

- ▲ HAND PENETROMETER
- ▮ TORVANE
- ● UNCONFINED COMPRESSION
- ○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:
NO FREE WATER ENCOUNTERED DURING DRILLING

DRY AUGER: 0 TO 15 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

LOG OF BORING NO. B-11

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396
Phone: 713-699-4000 Fax: 713-699-9200

PROJECT: G/S for Proposed Cimarron Elementary School, Galena ISD

LOCATION: Harris County, Texas

PROJECT NO.: 25-283E STATION NO.:

DATE: 4-19-25 COMPLETION DEPTH: 15.0 ft.

DEPTH, ft	SPT N-VALUE blows per foot	OVM, ppm	SYMBOL	SAMPLES	DESCRIPTION ELEVATION: Existing Grade	NATURAL MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	SUCTION (pF)	DRY UNIT WEIGHT, pcf	PERCENT COMPACTION	PASSING/FAILING (P/F)
0					FILL: LEAN CLAY (CL), stiff, dark brown, reddish brown, with root fibers to 2', sand seams and layers, gravels									
					LEAN CLAY (CL), very stiff, dark brown, reddish brown, with root fibers to 4', sand seams and layers, gravels									
5					FAT CLAY (CH), stiff, dark brown, reddish brown, with root fibers to 8', gravels	25	56	20	36					
					- very stiff 6' to 8'									
					- light brown, ferrous and calcareous nodules 8' to 15'									
10														
					- very stiff 13' to 15'									
15														
20														
25														
30														

UNDRAINED SHEAR STRENGTH, tsf

- ▲ HAND PENETROMETER
- ▮ TORVANE
- ● UNCONFINED COMPRESSION
- ○ UNCONSOLIDATED-UNDRAINED TRIAXIAL

0.5 1.0 1.5 2.0 2.5

WATER OBSERVATIONS:
NO FREE WATER ENCOUNTERED DURING DRILLING

DRY AUGER: 0 TO 15 ft.
WET ROTARY: ____ TO ____ ft.

DRILLED BY: Blake (T)
LOGGED BY: Joel

October 9, 2025

PROJECT: Old Cimarron Elementary School
816 Cimarron Street
Houston, Texas 77015

OWNER: Galena Park Independent School District
14705 Woodforest Blvd
Houston, Texas 77015
Attn.: Donna Sarkodi
936-672-9854
Email: dsarkodi@galenaparkisd.com

CONSULTANT: Honesty Environmental Services, Inc.
2300 Highway 365, Suite 450
Nederland, Texas 77627
DSHS Asbestos Consultant Agency License No. 10-0182
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HES Project No.: 25B-2705-17130

SUMMARY OF WORK:

Honesty Environmental Services, Inc. (HES) created technical specifications for the proper removal, transportation, and disposal of asbestos-containing materials discovered at the Old Cimmaron Elementary School located at 816 Cimarron Street in Houston, Texas.

GENERAL REGULATORY REQUIREMENTS

A regulated area must be established where abatement will be conducted. Warning signs, in both English and Spanish, as required by the Texas Department of State Health Services (DSHS), shall be placed inside all entrances to the work area. Signs must be placed in locations that prohibit entrance to regulated areas by unauthorized personnel. Asbestos caution tape must be used to demarcate the asbestos regulated areas.

The work area shall be accessed through a decontamination unit, which will be attached to the enclosed work area.

Negative air machines are to be attached to the containment work area. Contractor shall maintain a reduced air pressure within the contained work areas of at least 0.02 inches water gauge. The negative air equipment, equipped with high efficiency particulate air (HEPA) filters, shall draw air out of the containment and filter the airborne dust before venting outside the building. This machine will create diminished air pressure in the containment to prevent the release of air and dust from the work area.

Openings between contained areas and adjacent areas, including but not limited to windows, doorways, elevator openings, corridor entrances, ventilation openings, drains, ducts, grills, grates, diffusers, skylights, and **lay-in suspended ceiling grid system where the space above the grid is open to other rooms** shall be sealed **(CRITICALS INSTALLED)**, with exceptions of the means of entry and exit.

Protect all wall surfaces, as necessary, within the work area with minimum 2 layers of 4-mil polyethylene sheeting, tape and/or adhesives. Plastic sheeting shall be installed so as to minimize joints and shall extend beyond wall floor joints at least 12 inches. Use a minimum of two layers of 6-mil plastic on floors and all fixed horizontal surfaces. Cover floors first so that plastic extends at least 12 inches up on the walls, then cover walls with a minimum of two layers of 4-mil plastic sheeting which shall extend beyond wall/floor joints at least 12 inches. No seams shall be located at wall-to-floor joints. Where only floor tile and/or floor mastic are to be removed, contractor may opt to install a minimum of one layer of 6-mil polyethylene sheeting to a height of four feet on walls in the work area prior to removal.

The workers shall use wet methods to control dust in the area.

The abated material will be placed in two plastic disposal bags (double-bagged) in containment and sealed. The bags shall then be wet wiped and placed into clean bags in the decontamination unit, sealed and transported to a licensed landfill for proper disposal. Waste shipment manifests shall be completed at this time.

Workers shall wear, at a minimum, half-faced respirators equipped with HEPA filters, protective suits, and gloves for protection. Proper RFCI methods may be utilized. The Contractor shall inform himself of the conditions for the project and is responsible for verifying the quantities and location of all work to be performed as outlined in this section. Failure to do so shall not relieve the Contractor of his obligation to furnish all materials and labor necessary to carry out the provisions of the Contract.

Before asbestos-containing materials are disturbed, engineering controls shall be implemented in accordance with applicable agencies such as the Environmental Protection Agency (EPA), OSHA and DSHS regulations to prevent contamination of non-work areas. Air monitoring shall be conducted during and after the removal activities to verify that the building is not contaminated as a result of the abatement project.

REMOVAL OF INTACT COMPONENT ASBESTOS-CONTAINING MATERIALS

Intact component removal may be used for the following ACM: (A) removal of an asbestos cement sheet or wall panel by unbolting or unscrewing and removing the whole sheet or panel intact; (B) removal of a lab-type asbestos cement desktop by either unbolting or unscrewing and removing the whole desktop intact; (C) removal of a nonfriable countertop or backsplash by completely removing the whole unit intact; (D) removal of a window unit with window glazing, if the window glazing is secured with tape or a similar material before removal, and the whole window unit with window glazing is removed intact; (E) picking up one or more loose floor tiles that have become completely disassociated from the floor and are either whole or slightly broken, but which are still intact and not RACM; (F) picking up a loose miscellaneous nonfriable item, such as a roll of linoleum, a loose gasket, or a loose shingle; (G) removal of a fire door with asbestos-containing insulation from its hinges by removing the whole door, including its hardware, intact; (H) removal of any other nonfriable building component by removing it as a whole component and keeping it intact; and (I) removal of any packings, gaskets and mastics by removing them whole and intact. ACM must not be RACM, must be in good condition and removed as a whole component, keeping the component intact with no breakage or generation of dust during the removal or collection. A regulated area must be established where asbestos abatement will be conducted, the material must be kept wet and, at minimum, asbestos caution tape must be used to

demarcate the regulated area.

This project will include the proper removal, transportation, and disposal of asbestos-containing materials from the Old Academic Center Building as listed below:

MATERIALS, LOCATIONS, AND QUANTITIES

Asbestos-Containing Building Material	Material Location	Approximate Quantity
Wall Plaster	***Rooms 119-134, 136, & Associated Corridors & Restrooms in 1957 Build Date***	***17,700 Square Feet***
Tan Surfacing Material on Upper Wall above Ceiling	***Above Ceiling Tile and behind Sheetrock in the LRC Library***	***388 Square Feet***
Black Caulking on Brick	***Old Incinerator Room***	***15 Linear Feet***
White Sink Bottom Insulation	***Room 110***	***1 Sink***
Gasket Material	***Around the Incinerator Door in the Old Incinerator Room***	***4 Linear Feet***
Chalkboard Mastic	***Throughout Classrooms in the 1954 & 1957 Build Dates***	***2 Chalkboards in each of the 36 Classroom/Office measuring 12'x4' each***

ASBESTOS ABATEMENT REQUIREMENTS

Materials shall be kept wet at all times and work areas shall be demarcated. Workers involved with the removal of the asbestos materials shall be DSHS certified/licensed and EPA NESHAP trained. All workers shall wear appropriate PPE at all times. Any abatement activities will follow all applicable rules and regulations, including DSHS TAHPR, EPA NESHAP and OSHA regulations. Contractor shall submit the EPA required 10-day notification prior to beginning work.

On-site ambient air monitoring and final air clearance will be conducted by Honesty Environmental Services, Inc. Final clearance air samples will be collected and analyzed by Phase Contrast Microscopy (PCM).

The Contractor shall inform himself of the conditions for the project and is responsible for verifying the quantities and location of all work to be performed as outlined in this section. Contractor shall be responsible for removing all materials listed. Failure to do so shall not relieve the Contractor of his obligation to furnish all materials and labor necessary to carry out the provisions of the Contract.

Before asbestos-containing materials are disturbed, engineering controls shall be implemented in accordance with Environmental Protection Agency (EPA), OSHA and DSHS regulations to prevent contamination of non-work areas. Air monitoring shall be conducted during and after the removal activities to verify that the building is not contaminated as a result of the asbestos abatement project.

The area of removal shall be isolated from adjacent non-work areas with the use of temporary walls

consisting of two layers of 6 mil plastic sheeting. The work area shall be accessed through a decontamination unit, which will be attached to the enclosed work area. Negative air machines are to be attached to the plasticized (containment) work area. The negative air equipment, equipped with high efficiency particulate air (HEPA) filters, shall draw air out of the containment and filter the airborne dust before venting outside the building. This machine will create diminished air pressure in the containment to prevent the release of air and dust from the work area.

The workers shall use wet methods to control dust in the area. The abated material will be placed in two plastic disposal bags (double-bagged) in containment and sealed. The bags shall then be wet wiped and placed into clean bags in the decontamination unit, sealed and transported to a licensed landfill for proper disposal. Waste shipment manifests shall be completed at this time.

Workers shall wear, at a minimum, half-face respirators equipped with HEPA filters, protective suits, and gloves for protection.

The work affecting the Asbestos-Containing Building Materials (ACBM) in and on the building shall be accomplished utilizing the rules and regulations found in the Texas Department of State Health Services Asbestos Rules and the EPA National Emission Standard for Hazardous Air Pollutants. All aspects of the OSHA Asbestos standard shall also apply.

The Contractor shall inform himself of the conditions for the project and is responsible for verifying the quantities and location of all work to be performed as outlined in this section. Failure to do so shall not relieve the Contractor of his obligation to furnish all materials and labor necessary to carry out the provisions of the Contract.

In the event of a hurricane or other similar weather during the abatement process, contractor at his own expense shall take the necessary steps to ensure that all loose asbestos materials are contained and removed from the jobsite in a timely manner as to prevent asbestos contamination before, during, and after the storm.

Glovebag Variance (if needed): The consultant hereby authorizes a variance in the abatement method: Proper glovebag techniques may be utilized during the removal process of the pipe insulation. One layer of duct tape will be placed around the pipe insulation at points where the glovebag is attached and the glovebag will be used in accordance with manufacturer's instructions. The asbestos containing pipe insulation shall be wet within the glovebag and two asbestos workers will be used per glovebag. The asbestos containing pipe insulation shall be cut and removed within the glovebag and the exposed piping scrubbed. The exposed piping shall be sealed with encapsulant. A HEPA vacuum shall be used to collapse the glovebag. The glovebag shall be removed from the pipe and placed inside an appropriately labeled 6-mil bag. These controls are established to reduce the likelihood of fiber release outside the work area during the removal process.

REMOVAL OF ASBESTOS-CONTAINING MATERIALS

SECTION 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

1.1.1 On-site ambient air monitoring and final clearance will be conducted by a third-party environmental consultant. Final clearance air samples in asbestos work areas will be collected and analyzed by Phase Contrast Microscopy (PCM).

1.1.2 Remove all asbestos-containing and contaminated materials leaving a clean substrate.

1.1.3 Remove and dispose of all asbestos-contaminated waste in accordance with applicable regulations and these specifications.

1.1.4 These materials have been identified as being impacted by the proposed demolition activities.

1.1.5 **START OF WORK:** The work start date shall be coordinated with the Owner. Any deviations to the start or completion of work date shall be coordinated with the Owner, DSHS, and the Consultant.

1.1.6 **PROJECT COMPLETION:** Project completion is yet to be determined.

1.1.7 **SUBMITTALS:** See section 1.7 - 1.11

1.1.8 **ABATEMENT CONTRACTOR'S DUTIES:**

1.1.8.1 Except as specifically noted, provide and pay for: labor, materials, equipment and other facilities and services necessary for proper execution and completion of work. The Contractor shall be solely responsible for the safety, efficiency, and adequacy of the ways, means, and methods and for any damage which might result from failure or improper construction, maintenance, or operation performed by the Contractor.

1.1.8.2 Pay legally required sales, consumer, use, payroll, privilege and other taxes.

1.1.8.3 Secure and pay for, as necessary, to provide proper execution and completion of work, and as applicable at the time of bids:

Permits
Government Fees
Licenses
Waste disposal permits and costs

1.1.8.4 Give required notices. Provide all necessary information to Owner in a timely manner so that the 10-day notification may be filed with DSHS, and work may start as scheduled.

1.1.8.5 Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities (including EPA regulations, AHERA, NESHAP, DSHS and OSHA) which bear on performance of work. Where conflicts occur between these specifications and/or the above-mentioned regulations, the more stringent shall govern.

1.1.8.6 If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he or she shall promptly notify Consultant in writing, and any necessary changes shall be accomplished by appropriate modification. It is not the Abatement contractor's responsibility to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Abatement contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to Consultant, he or she shall assume full responsibility therefore

and shall bear all cost attributable thereto.

1.1.8.7 PLAN OF ACTION: Submit a detailed plan of action for the procedures proposed for use in complying with the requirements of this specification. Utilize shop drawings, 8 1/2 x 11 format and include the location and layout of work areas, secure areas for storage, hazardous materials storage, the sequencing of abatement work, the interface of trades involved in the performance of the work, methods to be used to assure the safety of the workers, the public, and visitors to the site, a disposal plan with the location of the approved disposal site, and a detailed description of the methods to be employed to control pollution. The plan must be delivered to the Owner prior to commencement of work.

1.1.8.8 INSPECTION: Prior to the commencement of the work, inspect the areas where work will be performed. Document and submit to the Consultant any discrepancies in the scope prior to starting the work. The Abatement contractor is responsible for any and all site inspections, estimations of quantity of work, or recognition of unusual or special conditions which may affect a timely and scheduled completion of this work. The Abatement contractor shall satisfy himself that the work can be completed as set forth by the specifications before starting work.

1.1.8.9 POTENTIAL ASBESTOS HAZARD: The disturbance or dislocation of asbestos-containing materials may cause asbestos dust to be released into the atmosphere and deposited on surfaces, creating a potential health hazard. Apprise all workers, supervisory personnel, subcontractors, and consultants who will be at the job site of the seriousness of the hazard and of proper work procedures which must be followed.

1.1.8.10 CONTRACTOR USE OF PREMISES: Eating or drinking will not be permitted in or around the work area, showers or clean room at any time. Smoking is not permitted on the property. Confine the work activities within the designated area of construction. Do not block drives or access to other portions of the site.

1.1.8.11 Enforce strict discipline and good order among employees. Do not employ on the project unfit persons or persons not skilled in assigned task.

1.1.8.12 Comply with all applicable federal, state, and local laws regarding job discrimination and payment of prevailing wage rates.

1.1.8.13 The use of the best available technology, procedures, and methods for preparation, execution, cleanup, disposal, and safety are absolutely required. This compliance is the sole responsibility of the abatement contractor.

1.1.8.14 Coordinate all work schedules with the Owner and Consultant and assist in submitting DSHS 10-day notice prior to the start of the work.

1.1.8.15 Provide personnel monitoring of workers on a daily basis as required by OSHA. OSHA compliance air monitoring records conducted daily during the work are to be submitted with closeout documents.

1.1.8.16 Assume full responsibility for the proper and safe execution of the work.

1.1.9 **COORDINATION:** The General Contractor shall be responsible for the coordination and scheduling of the total project. The General Contractor shall be responsible for the performance of his Subcontractors and shall cooperate with the Consultant so as to facilitate the general progress of the work.

1.2 STOP WORK:

1.2.1 If the Owner, or his designated representative, presents a written or verbal stop work order, immediately stop all work or at that portion of the work designated. A verbal stop work order shall be confirmed by a written stop work order within 24 hours. Do not commence referenced work until authorized in writing by the Owner or his designated representative.

1.3 ABATEMENT CONTRACTOR USE OF PREMISES:

1.3.1 **GENERAL:** During the abatement period the Abatement contractor shall have the exclusive use of the premises included in the current work phase for abatement operations.

1.3.2 **USE OF SITE:** Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project abatement.

1.3.2.1 Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Do not use these areas for parking or storage of materials.

1.3.2.2 Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to areas acceptable to Owner. If additional storage is necessary, obtain and pay for such storage off-site.

1.3.2.3 Do not load structure with weight that will endanger structure.

1.3.2.4 Assume full responsibility for protection and safekeeping of products stored on premises.

1.3.2.5 Take all cautions necessary to ensure there is no asbestos contamination to those areas not included in work schedule. Should areas outside the work area become contaminated with asbestos-containing materials due to poor work practices, the Abatement contractor shall immediately clean them utilizing the wet cleaning and HEPA vacuum methods specified herein.

1.3.3 **ABATEMENT CONTRACTOR'S USE OF PREMISES:** Maintain the existing building in a safe and weather tight condition throughout the abatement period. Repair damage caused by abatement operations to original conditions. Take all precautions necessary to

protect the building and its occupants during the abatement period.

1.3.3.1 Keep public areas such as hallways, stairs, elevator lobbies, and toilet rooms free from accumulation of waste material, rubbish or abatement debris.

1.3.3.2 Smoking or open fires will not be permitted within the building enclosure or on the premises.

1.4 DEFINITIONS:

1.4.1 GENERAL EXPLANATION: A substantial amount of specification language constitutes definitions for terms found in other contract documents including the drawings. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon. Certain terms used in contract documents are defined in this article. Definitions and explanations of this section are not necessarily either complete or exclusive but are general for the work to extent they are not stated more explicitly in another element of contract documents.

1.4.2 GENERAL REQUIREMENTS: The provisions or requirements of Division-1 sections apply to entire work of Contract, and where so indicated, to other elements which are included in the project.

1.4.3 INDICATED: The term "indicated" is a cross-reference to graphic representations, notes, or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping the reader locate cross-reference, and no limitation of location is intended except as specifically noted.

1.4.4 DIRECTED, REQUESTED, ETC: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Consultant", "requested by the Consultant", and similar phrases. However, no such implied meaning will be interpreted to extend the Consultant's responsibility into Contractor's responsibility for construction supervision.

1.4.5 APPROVE: Where used in conjunction with the Consultant's response to submittals, requests, applications, inquiries, reports, and claims by Abatement contractor, the meaning of the term "approved" will be held to limitations of the Consultant's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by the Consultant be interpreted as a release of Abatement contractor from responsibilities to fulfill requirements of contract documents.

1.4.6 FURNISH: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

1.4.7 INSTALL: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, as applicable in each instance.

1.4.8 PROVIDE: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

1.4.9 INSTALLER: The term "installer" is defined as the entity (person or firm) engaged by Abatement contractor, or its subcontractor or sub-subcontractor for performance of a particular unit of work at project site, including installation, erection, application, and similar required operations. It is a general requirement that such entities (installers) be expert in operations they are engaged to perform.

1.4.10 PROJECT ADMINISTRATOR: The entity described as the "Project Representative" in AIA Document A201 "General Conditions of the Contract for Construction". The Project Administrator is a representative of the Owner at the job site with authority to stop the work upon verbal order if requirements of the contract documents are not met or if in the sole judgment of the Project Administrator, the Consultant, Owner, the interests of the Owner, safety of any person or the owner's property are jeopardized by the work.

1.5 INDUSTRY STANDARDS:

1.5.1 GENERAL APPLICABILITY OF STANDARDS: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, applicable standards are written directly into the contract documents, applicable standards of the construction industry have the same force and effect and are made a part of contract documents by reference as if copied directly into contract documents, or as if published copies were bound herewith.

1.5.2 REFERENCED STANDARDS: Referenced directly in contract documents or by governing regulations have precedence over non-referenced standards which are recognized in industry for applicability to work.

1.5.3 NON-REFERENCED STANDARDS: Hereby defined to have no particular applicability to the work, except as general requirements of whether the work complies with standards recognized in the construction industry.

1.5.4 PUBLICATION DATES: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.

1.5.5 COPIES OF STANDARDS: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.

1.5.6 ABBREVIATIONS AND NAMES: The following acronyms, or abbreviations as referenced in contract documents, are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents.

AIA American Institute of Architects
1735 New York Ave. NW

	Washington, DC 20006	(202) 626-7474
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018	(212) 354-3300
ASHRAE	American Society for Heating, Refrigerating & Air Conditioning 1791 Tullie Circle NE Atlanta, GA 30329	(404) 636-8400
ASTM	American Society for Testing & Materials 1916 Race Street Philadelphia, PA 19103	(215) 299-5400
CFR	Code of Federal Regulations Available from Government Printing Office Washington, DC 20402 (usually first published in Federal Register)	
EPA	Environmental Protection Agency 401 M Street SW Washington, DC 20460	(202) 382-3949
NEC	National Electrical Code (by NFPA)	
NESHAP	National Emission Standards for Hazardous Air Pollutants	
NFPA	National Fire Protection Association Batterymarch Park Quincy, MA 02269	(617) 770-3000
OSHA	Occupational Safety & Health Administration (U.S. Dept. of Labor) Government Printing Office Washington, DC 20402	
UL	Underwriters Laboratories 333 Pfingsten Road Northbrook, IL 60062	(312) 272-8800

1.6 CODES AND REGULATIONS:

1.6.1 **GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS:** Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

1.6.2 **FEDERAL REGULATIONS:** Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials including but not limited to the following:

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA), including but not limited to:

General Industry
Title 29, Part 1910, Section 1001 of the Code of Federal Regulations

Respiratory Protection
Title 29, Part 1910, Section 134 of the Code of Federal Regulations

Construction Industry
Title 29, Part 1926.1101, and 1926.62 of the Code of Federal Regulations

Access to Employee Exposure & Medical Records
Title 29, Part 1910, Section 20 of the Code of Federal Regulations

Hazard Communication
Title 29, Part 1910, Section 1200 of the Code of Federal Regulations

Specifications for Accident Prevention Signs and Tags
Title 29, Part 1910, Section 145 of the Code of Federal Regulations

U.S. Environmental Protection Agency (EPA) including but not limited to:

Worker Protection Rule
40 CFR Part 763, Subpart G
CPTS 62044, FKR 2843-9
Federal Register, Vol. 50, No. 134, 7/12/85
P28530-28540
Regulation for Asbestos
Title 40, Part 61, Subpart A of the
Code of Federal Regulations

National Emission Standard for Asbestos
Title 40, Part 61, Subpart M of the Code of
Federal Regulations including Asbestos NESHAP
Revision; Final Rule, Federal Register;
Tuesday, November 20, 1990

Asbestos Hazard Emergency Response Act (AHERA)
Regulations 40 CFR 763 Subpart E

U.S. Department of Transportation (DOT) including but not limited to:

Hazardous Substances: Final Rule
Regulation 49 CFR, Parts 171 and 172

1.6.3 STATE AND LOCAL REGULATIONS: Abide by all state and local regulations which govern asbestos abatement work or hauling and disposal of waste materials, including

but not limited to Texas Asbestos Health Protection Rules.

1.6.4 **STANDARDS:** Those which govern abatement work or hauling and disposal of asbestos waste material include but are not limited to the following, or the latest update:

American National Standards Institute (ANSI)

Fundamentals Governing the Design and operation of Local Exhaust Systems Publication Z9.2-79

Practices for Respiratory Protection Publication Z88.2-92

1.6.5 **EPA GUIDANCE DOCUMENTS:** Those which discuss asbestos abatement work or hauling and disposal of asbestos waste materials are listed below only for the Contractor's information. These documents do not describe the work and are not a part of the work of this contract.

Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book) EPA560/5-85-024.
Asbestos Waste Management Guidance EPA 530-SW-85-007.

1.6.6 **NOTICES:**

1.6.6.1 **U.S. ENVIRONMENTAL PROTECTION AGENCY:** Assist Owner with compilation of necessary information for submission of written notification as required by USEPA National Emission Standards for Hazardous Air Pollutants (NESHAP) Asbestos Regulations (40 CFR 61, Subpart M as amended) to the regional Asbestos NESHAP Contact or the delegated state or local agency at least 10 working days prior to beginning any work on asbestos-containing materials. Should abatement work begin on a date other than that contained in the original notice, assist Owner with the re-notification as per regulations.

1.6.7 **PERMITS:** Obtain all building and special permits required for all the asbestos abatement work.

1.6.8 **LICENSES:** Maintain current licenses as required by applicable state or local jurisdictions for the removal, transporting, disposal, or other regulated activity relative to the work of this contract.

1.6.9 **POSTING AND FILING OF REGULATIONS:** Maintain two (2) copies of applicable federal, state, and local regulations above. Post one copy of each at the job site. Keep on file in the Project Data Binder, covered earlier.

1.6.10 **SIGN REQUIREMENTS:** Project identification signs or abatement contractor or supplier informational signs in excess of that required by law shall be subject to approval by the Owner.

1.6.10.1 As required by OSHA regulations 29 CFR 1926.1101, warning signs shall bear the following information:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING ARE REQUIRED IN THIS AREA

1.6.10.2 Provide signs in English and Spanish in compliance with Texas Asbestos Health Protection Rules. Remove all signs upon completion of construction.

1.6.11 LABEL REQUIREMENTS: Provide labels affixed to all asbestos waste containers.

1.6.11.1 Warning labels as required by OSHA regulation 29 CFR 1926.1101 as follows:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

1.6.11.2 Informational labels as required by NESHAP regulation 40 CFR 61, Subpart M with the name of the waste generator and the location at which the waste was generated. If handwritten, use, at a minimum, indelible ink to legibly record the required information.

1.6.12 TRANSPORT SIGN REQUIREMENTS: Provide signs during waste transport and disposal as follows:

1.6.12.1 As required by the U.S. Department of Transportation, 49 CFR 171 and 172, warning signs shall display the following:

RQ HAZARDOUS
CLASS 9
SOLID, NOS,
ORM-E, NA 2212, III
(ASBESTOS)

1.6.12.2 As required by NESHAP, 40 CFR 61, Subpart M, mark vehicles used to transport asbestos-containing waste material during the loading and unloading of the waste so that the signs are visible as follows:

DANGER
ASBESTOS DUST HAZARD
CANCER AND LUNG DISEASE HAZARD
Authorized Personnel Only

1.7 SUBMITTALS: All submittals shall be delivered to the consultant at:
Honesty Environmental Services, Inc.
2300 Highway 365, Suite 450
Nederland, Texas 77627
Mr. Daniel Ward (409) 632-2601
Dan@honestyenvironmental.com

1.7.1 QUANTITY OF SUBMITTALS:

1.7.1.1 PRECONTRACT SUBMITTALS – three sets.

1.7.1.2 PREWORK SUBMITTALS – three sets.

1.7.1.3 PRODUCT SUBMITTALS – three sets.

1.7.1.4 CLOSEOUT SUBMITTALS – three sets.

1.7.2 APPROVAL:

1.7.2.1 No portion of the work requiring submittals shall be commenced until the submittals are approved by the Owner or his designated representative.

1.7.2.2 Delays to the work caused by late or disapproved submittals shall be the sole responsibility of the Contractor.

1.7.3 SUBSTITUTIONS:

1.7.3.2 Contractor's request for changes in the products, materials, equipment, and methods of construction required by the contract Documents are considered requests for substitutions.

1.7.4 ORGANIZATION OF SUBMITTALS:

1.7.4.1 All submittals shall be submitted to the Consultant in an organized fashion suitable for review.

1.7.4.2 All submittals shall be on an 8.5 x 11 format, in 3-ring binders, separated by tabs (marked to correspond with the section of the Specifications with which they apply). Personnel submittals shall be in the same sequence as outlined in the Specifications and in alphabetical order.

1.8 PRECONTRACT SUBMITTALS:

1.8.1 Within three (3) days after the date bids are opened the selected Contractors must submit (prior to consideration for execution of the agreement) the following data:

1.8.1.1 A list of at least three projects of similar scope and value to the project described in this bid document, successfully completed by the contractor within the past two years.

1.8.1.2 An Emergency Phone List of full-time supervisory personnel to be engaged in the contract, their training and job experience. The list shall be sufficient in scope to allow the Owner to contact a designated person in the Abatement Contractors Company on a 24-hour basis.

1.8.1.3 An outline of the workers' training courses, and medical surveillance program conducted by the company

1.8.1.4 The name of and evidence that the Project Superintendent has completed an EPA-approved contractor/supervisor certification course, or equivalent, and has a minimum of one year on the job experience.

1.8.1.5 A basic procedures manual endorsed or authorized by the company describing working procedures, equipment, and type of decontamination facilities, respirator program, and special removal techniques, etc.

1.8.2 CITATIONS AND VIOLATIONS: Provide a list of all citations and violations.

1.9 PREWORK SUBMITTALS:

Within seven days prior to the Preconstruction Conference the Abatement contractor shall submit to the Consultant the following documents. Maintain one (1) approved copy at the job site.

1.9.1 PROGRESS SCHEDULE: Provide proposed schedule using the bar graph method.

1.9.1.1 Show the complete sequence of construction by activity and the sequencing of work within each phase of work.

1.9.1.2 Show the dates for the beginning and completion of each major element (setup, removal, testing, etc.) of work, including substantial completion dates for each phase.

1.9.1.3 Show projected percentage of completion for each item, as of the first day of each week.

1.9.1.4 Show final inspection dates.

1.9.1.5 The schedule shall be formulated on a day/week basis, updated weekly, and revised as required.

1.9.2 INSURANCE COVERAGE: Submit copies of insurance coverage, including asbestos, automotive liability, worker's compensation, comprehensive general liability, special endorsement, and other coverage as required. Insurance policies must name the Owner and Consultant, and their agents, officers and employees, as additional insured parties on the original policy and all renewals or replacements during the term of this contract.

Abatement contractor agrees to procure and maintain all insurance provided below on an occurrence basis, using carriers reasonably acceptable to Owner and HES and carrying a Best rating of not less than A including insurance covering the obligations assumed by Abatement contractor. Such insurance shall be primary with respect to any other similar insurance available to Owner and HES and affiliated companies, notwithstanding the provisions of such insurance. Before any part of the work on jobsite is commenced, Abatement contractor shall, at Abatement contractor's sole cost cause to be issued and maintained during the entire progress of the Work not less than the insurance coverages set forth below. The contractor shall provide proof of insurance for the Abatement Contractor, Asbestos Transporter, and Disposal Site. There shall be no right of

subrogation against Owner and HES and this waiver of subrogation shall be endorsed upon all policies of insurance.

1.9.2.1 Automobile Liability insurance covering use of all owned, non-owned and hired vehicles used by or on behalf of the Abatement contractor, in connection with the work, with a combined bodily injury and property damage liability limits of not less than $1,000,000 per occurrence to include transportation of hazardous materials with specific environmental impairment provisions, in addition to the MCS 90 Endorsement.

1.9.2.2 Occurrence based Asbestos Specific Liability insurance including coverage for obligations assumed in the agreement for an amount not less than $1,000,000.00. Policy may not have asbestos exclusions. Worker's Compensation on a statutory basis and Employers Liability, including Occupational Disease, at limits of $500,000.

1.9.2.3 The Abatement contractor and/or Subcontractor responsible for transporting the asbestos-containing and/or asbestos-contaminated material to an approved U.S. Environmental Protection Agency (EPA) or Texas Natural Resource Conservation Commission (TNRCC) disposal site, will be properly licensed by the Texas Department of State Health Services (DSHS). The transporter shall meet the following minimum insurance requirements through insurers acceptable to Owner and HES on an occurrence basis.

1.9.2.4 Commercial General Liability including asbestos and other pollution environmental coverage at limits of $1,000,000 combined single limit.

1.9.2.5 Commercial Automobile Liability at limits of $1,000,000 combined single limit including the MCS 90 Pollution Endorsement and the ISO Pollution Endorsement for Hazardous Materials.

1.9.2.6 Worker's Compensation on a statutory basis and Employers Liability, including Occupational Disease, at limits of $500,000.

1.9.2.7 The disposal site shall meet the following minimum insurance requirements through insurers acceptable to Owner and HES on an occurrence basis.

1.9.2.8 Commercial General Liability at limits of $1,000,000 combined single limit.

1.9.2.9 Environmental Impairment Liability at limits of $1,000,000.

1.9.2.10 Commercial Automobile Liability at limits of $1,000,000, if applicable, to include hazardous materials.

1.9.2.11 Worker's Compensation on a statutory basis and Employers Liability, including Occupational Disease, at limits of $500,000.

1.9.3 **NOTICES:** Assist Owner with timely submission of notices required by federal, state, and local regulations.

1.9.4 **PERMITS:** Submit copies of current valid permits required by state and local regulations, including arrangements for storage, transportation, and disposal of contaminated material. Dump site must conform to EPA regulation 40 CFR 61.

1.9.5 **LICENSES:** Submit copies of all state and local licenses and permits necessary to carry out the work, including DSHS Asbestos Abatement Contractor license.

1.9.6 **CONTAINMENT AREA:** Show on Contract Drawings or an 8-1/2" x 11" plan the containment areas, including the locations and quantity of negative air pressure equipment, the location of all decontamination chambers, entrances, and emergency exists from the work areas.

1.9.7 **STORAGE AND SECURITY:** Show on a plan the location and construction of storage facilities and field office and security provisions in and around the premises.

1.9.8 **EQUIPMENT:** Submit manufacturer's certification that vacuums, negative pressure equipment, respirators, and air supply equipment meet all requirements of OSHA and EPA. Include descriptions of any equipment to be employed not previously discussed.

1.9.9 **SAMPLES:** Submit samples of warning signs and warning labels.

1.9.10 **WORKER TRAINING AND MEDICAL SURVEILLANCE**: Submit copies of training certificates, DSHS licenses, medical examinations and fit tests for each worker and project superintendent.

1.9.11 Provide historical air monitoring data to substantiate the choice of respiratory protection.

1.9.12 **LOGS**: Submit sample copies of daily progress log and visitor's log.

Visitors' Log: The Abatement contractor shall maintain a visitors' log at the work place and require all persons entering the asbestos work area to sign the log. The log should provide space for the following information:

1.9.12.1 Name, organization represented, date, time, and purpose of visit.

1.9.12.2 Certificate of release signed and filed with abatement contractor that those who enter the work environment have been informed of the hazards of asbestos.

Daily Log: The abatement contractor shall maintain a daily job log which shall be maintained by the Project Superintendent. The log shall have daily entries describing the progress and location of the work, any special conditions encountered, records of testing, amount removed, names of workers entering and exiting the containment areas, and any other pertinent data.

1.9.13 **NOTICES TO SUPPLIERS:** Copies of notices sent to suppliers of rental equipment and vehicles informing them of the nature of the use of their equipment.

1.9.14 **MATERIAL LIST:** Catalog cost of materials and items proposed to be furnished and used under this contract.

1.9.15 SUBCONTRACTORS LIST: Submit a list of all subcontractors to be used on the project. Any subcontractor must be acceptable to the Owner and the Consultant.

1.9.16 SCHEDULE OF VALUES: The Subcontractor shall submit a schedule of values. All applications for payment must include this form. The schedule of values must break down total amount of bid per removal area.

1.9.17 SAFETY DATA SHEET: Submit an SDS Sheet or equivalent for each material proposed for use on the work in accordance with the OSHA Hazard Communication Standard. Include a separate attachment for each sheet indicating the specific worker protective equipment proposed for use with the material indicated and/or manufacturer's specification.

1.10 PRODUCT SUBMITTALS:

1.10.1 GENERAL: Submit product data and samples required by Contract Documents. The abatement contractor shall be fully responsible for ensuring that the samples, materials, and equipment comply with the Specifications and for ensuring their suitability for use in the complete performance of his contract. Any deviations from the Contract Documents shall be boldly marked on the submittals by the abatement contractor for review by the Consultant. The Consultant shall review the submittals for general contract compliance only and does not accept any responsibility for the suitability of the products for proper functional use on the project.

1.10.2 PRODUCT DATA: Includes standard printed information on manufactured products that has not been specially prepared for this project, including but not limited to the following items: manufacturer's product specifications, installation instructions, and catalog cuts.

Clearly mark each copy to identify pertinent products or models and show performance characteristics and capacities.

Product data submittals shall contain:

1.10.2.1 The date of submission and the dates of any previous submissions.

1.10.2.2 The project title and number.

1.10.2.3 The names of abatement contractor, superintendent, and manufacturer.

1.10.2.4 Identification of the product, with the specification section number.

1.10.2.5 Applicable standards, such as ASTM or Federal Specification numbers.

1.10.2.6 Identification of deviations from Contract Documents.

1.10.2.7 Identification of revisions or resubmittals.

1.10.2.8 Contractor's stamp, initialed or signed, certifying the review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the

work and of Contract Documents.

1.11 CLOSEOUT SUBMITTALS:

1.11.1 SUBSTANTIAL COMPLETION: The date of substantial completion of a project or specified area of a project is the date when the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the Owner can occupy the project or specified area of the project for the use for which it was intended. Complete the following before requesting the Consultant inspection for certification of substantial completion for the work. List known exceptions in the request.

1.11.1.1 Submit a statement showing an accounting of changes to the Contract Sum.

1.11.1.2 Submit a description of any unresolved issues or items related to the Contract.

1.11.1.3 Submit a request for inspection. The request shall include a summary of items remaining to be completed based on the Contractor's inspection of the project.

1.11.2 FINAL ACCEPTANCE: Complete the following Record Documents before requesting the Consultant certification of final acceptance and final payment as required by the General Conditions. Submit all Record Documents in a loose-leaf binder with identifying tabs. List known exceptions, if any, in request.

1.11.2.1 Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

1.11.2.2 Submit an updated final statement, accounting for all change orders, liquidated damages, and other charges or credits against the contract.

1.11.2.3 Submit a final liquidated damages settlement statement, acceptable to the Owner.

1.11.2.4 Submit a copy of the Consultant's punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Consultant.

1.11.2.5 Submit consent of surety.

1.11.2.6 Submit Release of Liens and Certification that all Bills Have Been Paid: A sworn statement and affidavit from the Contractor to the Owner stating that all bills for this job have been paid and that the Owner is released from any and all claims and damages, shall be required before payment is made.

1.11.2.7 Guarantee of Work: Sworn statement that all work is guaranteed against defects in materials and workmanship for one year from date of Owner's acceptance, except where specified for longer periods.

A. Word the guaranty as follows: "We hereby guarantee all work performed by

us on the above captioned project to be free from defective materials and workmanship for a period of one (1) year or such longer period of time as may be called for in the Contract Documents for such portions of the work." All guarantees and warranties shall be obtained in the Owner's name.

B. Within the guaranty period, if repairs or changes are requested in connection with guaranteed work which, in the opinion of the Owner, is rendered necessary as a result of the use of materials, equipment, or workmanship which are inferior, defective or not in accordance with the terms of the contract, the Contractor shall promptly, upon receipt of notice from and without expense to the Owner, place in satisfactory condition in every particular, all such guaranteed work, correct all defects therein and make good all damages to the buildings, site, equipment or contents thereof.

C. If, after notice, the Contractor fails to proceed promptly to comply with the terms of the guaranty, the Owner may have the defects corrected and the Contractor and his sureties shall be liable for all expense incurred.

D. All special guarantees applicable to define parts of the work stipulated in the project manual or other papers forming part of the contract shall be subject to the terms of this paragraph during the first year of the life of such special guaranty.

1.11.2.8 Submit all additional certificates, warranties, guarantees, bonds or documents as called for in the individual sections of the Project Manual. The Contractor is responsible for examining the Project Manual for these requirements.

1.11.2.9 Submit certification that rental vehicles and equipment have received clearance inspection by consultant prior to return to rental company.

1.11.2.10 Submit copy of the fully completed Waste Shipment Record (WSR) or documentation of compliance with NESHAP 61.150(d)(3) and (4). Submit all copies of dump receipts and waste manifests signed by the landfill within thirty-five days following completion of the project

1.11.2.11 Submit OSHA compliance air monitoring records conducted daily during the work.

1.11.2.12 Submit copies of the daily progress log.

1.11.2.13 Submit copies of Visitors' Log.

1.11.2.14 Submit copies of the plans, legibly marked to give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.

1.11.3 Submittal Review:

1.11.3.1 Partial submittals may be rejected for non-compliance with the Contract Documents.

1.11.3.2 Review by Consultant does not relieve Abatement Contractor from responsibility for errors which may exist in the submitted date.

1.11.3.3 Make revisions when required by the Consultant and resubmit for review.

1.11.3.4 Subsequent Reviews: All cost associated with reviews required beyond the first review will be paid by Abatement Contractor.

1.11.4 DUTIES: Owner and Consultant

1.11.4.1 Review submittals with reasonable promptness and in accordance with schedule.

1.11.4.2 Indicate requirements for revisions and resubmittal, if any.

1.11.4.3 Return submittals to abatement contractor for distribution, or for resubmission.

1.12 TEMPORARY FACILITIES:

1.12.1 Provide and maintain temporary facilities required for abatement work, remove on completion of work.

1.12.2 REQUIREMENTS OF REGULATORY AGENCIES: Comply with all applicable codes and regulations.

1.12.3 MATERIALS AND EQUIPMENT:

1.12.3.1 GENERAL: Provide new or used materials and equipment that are undamaged and in serviceable condition. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.

1.12.4 SCAFFOLDS, LADDERS, ETC.:

1.12.4.1 Provide all scaffolding, ladders and/or staging, etc. as necessary to accomplish the work of this contract. Scaffolding may be of suspension type, or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding shall comply with all applicable OSHA provisions.

1.12.4.2 Equip rungs of all metal ladders, etc. with an abrasive nonslip surface.

1.12.4.3 Provide a nonskid surface on all scaffold surfaces subject to foot traffic.

1.12.5 GUARDRAILS, BARRICADES, AND COVERINGS:

1.12.5.1 Provide guardrails, handrails, and covers for floor, roof and wall openings and stairways.

1.12.5.2 Provide suitable temporary watertight coverings over openings as required to protect interior work from inclement weather.

1.12.5.3 Comply with requirements of all federal, state, and local authorities having jurisdiction for the protection of persons and property.

1.12.6 TEMPORARY SANITARY FACILITIES:

1.12.6.1 Existing toilet facilities at the site may not be used by the abatement contractor's personnel during performance of the work.

1.12.7 TEMPORARY FIRE PROTECTION:

1.12.7.1 Provide and maintain temporary fire protection during construction in accordance with requirements of the local protection code.

1.12.7.2 Provide Type "A" fire extinguisher for temporary offices and similar spaces where there is minimal danger of electrical or grease-oil-flammable liquid fires. In other locations provide type "ABC" dry chemical extinguisher, or a combination of several extinguisher of NFPA recommended types for the exposures in each case.

1.12.8 TEMPORARY PROJECT SUPERINTENDENT'S FIELD OFFICE:

1.12.8.1 If desired, temporary offices may be provided by the abatement contractor. If temporary offices are provided, coordinate location of placement with the Owner and General Contractor.

1.12.8.2 Temporary offices provided by the abatement contractor shall be in a weather and watertight building or trailer, and shall be maintained in a neat, orderly appearance.

1.12.8.3 Arrange with utility companies to provide water and electricity for office as required. Pay all costs for meters, installation, maintenance, removal and service charges for utilities.

1.12.9 TEMPORARY STORAGE:

1.12.9.1 Provide required weatherproof storage sheds and maintain in good condition and neat appearance. Location of storage sheds and trailers shall be acceptable to the Owner.

1.12.9.2 Construct storage sheds on proper foundations, securely anchored in place.

1.12.10 EXECUTION:

1.12.10.1 Maintain and operate systems to assure continuous service.

1.12.10.2 Modify and extend systems as work progress requires.

1.12.11 SCAFFOLDING:

1.12.11.1 During the erection and/or moving of scaffolding, care must be exercised so that the polyethylene floor covering is not damaged.

1.12.11.2 Maintain scaffolding free of accumulated debris during the work.

1.12.12 INSTALLATION, GENERAL:

1.12.12.1 Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the work.

1.12.13 REMOVAL:

1.12.13.1 Completely remove temporary materials and equipment when their use is no longer required.

1.12.13.2 Clean and repair damage caused by temporary installations or use temporary facilities.

1.12.13.3 Restore existing facilities used for temporary services to specified or original condition.

1.13 CUTTING AND PATCHING:

1.13.1 SCOPE: To set forth broad, general conditions covering cutting and patching that applies to all aspects of the job.

1.13.2 Execute cutting, including fitting or patching or work required to:

1.13.2.1 Make several parts fit properly.

1.13.2.2 Uncover work to provide for installation of ill-timed work.

1.13.2.3 Gain access to hidden work.

1.13.2.4 Remove and replace work which is defective or does not conform to contract requirements.

1.13.2.5 Make level and true all surfaces accidentally destroyed or damaged.

1.13.2.6 Finish all surfaces exposed by the project to complete the installation of reapplied surfaces not covered under other sections of the Contract Documents.

1.13.3 In addition to contract requirements, upon the Consultant's written instructions:

1.13.3.1 Uncover work for observation of covered work.
1.13.3.2 Remove samples of installed materials for testing.

1.13.3.3 Remove work to provide alteration of existing work.

1.13.4 Do not cut or alter work of another contractor without his written consent.

1.13.5 Payment for Costs: Costs caused by ill-timed or defective work or work not conforming to contract documents will be borne by the party responsible for ill-timed, rejected, or nonconforming work.

1.13.6 VENTILATION

1.13.6.1 Provide local exhaust ventilation systems that comply with ANSI Z9.2-1979.

1.13.7 MATERIALS

1.13.7.1 Materials for replacement or work removed: Comply with specifications for type of work to be done.

1.13.8 INSPECTION: Inspect existing conditions to define limits of work, including elements subject to movement or damage during cutting and patching.

1.13.9 PREPARATION PRIOR TO CUTTING: Provide shoring, bracing, and support as required to maintain structural integrity of materials and systems. Provide protection for other portions of project and protection from the elements.

1.13.10 PERFORMANCE:

1.13.10.1 Execute cutting and demolition by methods which prevent damage to other work and will provide surfaces to receive installation of repairs and new work. Protect existing electrical and electronic systems, cabling, and other components during all phases of abatement.

1.13.10.2 Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

1.13.10.3 Refinish entire surfaces as necessary to provide an even finish. Refinish continuous surfaces to the nearest intersection and assemblies entirely.

1.13.10.4 Perform cutting, drilling, abrading, or penetration of any asbestos-containing material in a manner to minimize the dispersal of asbestos fibers into the air.

1.13.10.5 Use specialized equipment such as drills or saws having integral ventilation hoods which are connected to a HEPA vacuum with a flexible hose. Handle and dispose of HEPA filters as contaminated material.

1.13.10.6 Thoroughly saturate absorbent surfaces of asbestos-containing material to be penetrated with a penetrating type encapsulant. Allow encapsulant to penetrate to substrate before working on materials.

1.13.10.7 Seal edges of asbestos-containing materials exposed by cutting, drilling, or abrading, etc. with two (2) coats of an approved penetrating encapsulant applied in accordance with manufacturers printed instruction.

SECTION 2 - EXECUTION

PART 1 - GENERAL

2.1 **SCOPE:** This section covers the removal of asbestos-containing materials. This work shall be done in strict accordance with the specifications. Compliance with all applicable Federal, State, and local regulations and the use of the best available technology, procedures, and methods for preparation, execution, cleanup, disposal, and safety are absolutely required. This compliance is the sole responsibility of the abatement contractor.

2.2 **DESCRIPTION:** Furnish all labor, materials, services, insurance, and equipment in accordance with the most stringent requirements of DSHS, EPA and OSHA and all other applicable regulatory agencies, to complete the removal of asbestos-containing materials.

2.3 **TERMINOLOGY** (Definitions):

2.3.1 **ABATEMENT:** Procedure to control fiber release from asbestos-containing building materials.

2.3.1.1 Removal - All herein specified procedures necessary to remove asbestos-containing materials from an area and dispose of the materials at an acceptable site in an acceptable manner.

2.3.1.2 Post-Removal Encapsulation - Procedures necessary to coat surfaces from which asbestos-containing materials have been removed to control any residual fiber release.

2.3.1.3 Abatement Activities - Any activity requiring respiratory protection as per this project manual which disturbs or has the potential to disturb any asbestos-containing building material. This includes, but is not limited to, the following activities: precleaning, installing polyethylene, ACBM removal, encapsulation, and enclosure.

2.3.2 **ACBM OR ACM:** Asbestos-containing building materials or asbestos-containing materials.

2.3.3 **AIR LOCK:** A system for permitting ingress or egress without permitting air movement from contaminated areas into an uncontaminated area, typically consisting of two curtained doorways at least 3 feet apart.

2.3.4 **AIR MONITORING:** The process of measuring the fiber content of a specific volume of

air in a stated period of time. For PCM method, NIOSH Analytical Method 7400 shall be used. When aggressive air sampling is specified, blowers/fans are used to disperse settled fibers into the air during sampling. For TEM method, as described in 40 CFR 763, Subpart E (AHERA Protocol).

2.3.5 AMENDED WATER: Water to which a surfactant has been added to reduce water surface tension and thereby provide a more rapid penetration.

2.3.6 AUTHORIZED VISITOR: The Owner, the Consultant, or a representative of any regulatory or other agency having jurisdiction over the project.

2.3.7 BARRIER: Any surface which inhibits air and fiber movement from the work area to non-work areas can be comprised of one or a combination of several materials, including but not limited to plywood, polyethylene sheeting and/or duct tape. A critical barrier is one which seals any opening (such as doorways, vents, windows, penetrations) between the work area and non-work area.

2.3.8 CURTAINED DOORWAY: Device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing three overlapping sheets of opaque 6-mil polyethylene over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of the first and last sheets along one vertical side of the doorway and securing the middle sheet along the opposite vertical side of the doorway.

2.3.9 DECONTAMINATION ENCLOSURE SYSTEM: A series of connected rooms, with air locks between any two adjacent rooms, for the decontamination of workers and/or materials and equipment, constructed or moved onto site.

2.3.10 EQUIPMENT DECONTAMINATION UNIT: Decontamination enclosure system for materials and equipment, typically consisting of a designated area or the work area, a washroom and a holding room.

2.3.11 GROSS ABATEMENT AREA: An asbestos removal area which is sealed and fully contained in polyethylene. Workers enter the abatement area through a decontamination enclosure system.

2.3.12 PERSONNEL DECONTAMINATION UNIT: A decontamination enclosure system for workers, typically consisting of a designated area of the work area for a gross contaminant removal, an equipment room, an air lock, a shower, an air lock, and a clean room.

2.3.12.1 Equipment Room: A contaminated area or room in the personnel decontamination enclosure system with provisions for storage of contaminated clothing and equipment.

2.3.12.2 Air Lock: An area between rooms, with minimum width of 3 feet.

2.3.12.3 Shower Room: A room between the two air locks in the personnel decontamination enclosure system with hot and cold running water suitably arranged for complete showering during contamination.

2.3.12.4 Clean Room: An uncontaminated area or room which is part of the worker decontamination unit with provisions for storage of worker' street clothes and protective equipment.

2.3.13 FIXED OBJECT: A unit of equipment or furniture in the work area which cannot be removed from the work area without dismantling.

2.3.14 HEPA FILTER: A high efficiency particulate air (HEPA) filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns in length.

2.3.15 HEPA VACUUM EQUIPMENT: High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers greater than 0.3 microns in length.

2.3.16 NEGATIVE AIR PRESSURE EQUIPMENT: A local exhaust system, capable of maintaining a constant, low velocity air flow through the Decontamination Unit and into the Work Area from adjacent uncontaminated areas and exhausting that air outside the building through HEPA filters.

2.3.17 NIOSH: National Institute for Occupational Safety and Health.

2.3.18 PLASTICIZING: Procedures necessary using polyethylene sheeting, adhesives, and/or taping to seal an area airtight. All polyethylene sheeting shall be certified by the Underwriters Laboratory as being fire retardant.

2.3.19 POST REMOVAL ENCAPSULATION: Application of liquid material to surfaces from which asbestos-containing materials have been removed to control the possible release of residual asbestos fibers, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components (penetrating encapsulant).

2.3.20 SURFACTANT: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.

2.3.21 WASTE GENERATOR: Any owner or operator of a source covered by NESHAP regulations whose act or process produces asbestos-containing waste.

2.3.22 WASTE SHIPMENT RECORD (WSR): The shipping document, required by 40 CFR 61, Subpart M, to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste.

2.3.23 WET CLEANING/WIPING: The process of eliminating contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.

2.4 EXISTING CONDITIONS:

2.4.1 Owner and abatement contractor shall agree in writing on building and fixture condition

prior to commencement of work. It shall be the Contractor's responsibility to replace or repair to the Owner's satisfaction, prior to closeout of the project, all damaged items caused by the Contractor and not proven otherwise. All items damaged prior to abatement shall be noted during preconstruction walk-through.

PART 2 - EQUIPMENT AND MATERIALS

2.5 PERSONNEL PROTECTION REQUIREMENTS:

2.5.1 Prior to commencement of work, the workers shall be instructed and shall be knowledgeable on the hazards of asbestos exposure, use and fitting of respirators, protective clothing, decontamination procedures, and all aspects of asbestos work procedures; workers shall have medical examinations and fit tests.

2.5.2 The abatement contractor acknowledges that he or she alone is responsible for enforcing personnel protection requirements and that these specifications provide only a minimum acceptable standard for each phase of operation. The Certificate of Workers Release Form included in the attachments shall be signed by each worker.

2.5.3 Provide workers with personally issued and marked respiratory equipment approved by NIOSH and accepted by OSHA.

2.5.4 Provide extra respiratory equipment for authorized visitors.

2.5.5 Respirator selection shall be based on the following table:

RESPIRATOR SELECTION	MAXIMUM USE CONCENTRATION
Half-Face Air-Purifying with HEPA Filters	0.1 f/cc
Full-Face Air-Purifying with HEPA Filters	0.5 f/cc
Powered Air-Purifying (PAPR) Full-Face with HEPA Filter	0.5 f/cc
Full-Face Supplied Air, Pressure Demand + HEPA escape	10 f/cc

Note: The Maximum Use Concentration represents the maximum fiber concentration outside the respirator to maintain exposure inside the respirator below 0.01 f/cc.

2.5.6 Supplied air shall be grade D in compliance with 29 CFR 1910.134, Compressed air system shall incorporate a continuous carbon-monoxide monitoring device, in-line purifying absorbent beds and filters to deliver air free of water, oil, odors, vapors, and particulates, a compressor failure alarm, high-temperature alarm, high-pressure automatic air storage within an ASME certified air bank to provide sufficient air supply for decontamination in the event of a system failure. Abatement contractor shall comply with all applicable codes and regulations that apply to the operation of such system.

2.5.7 WHERE NOT IN VIOLATION OF NIOSH AND OSHA REQUIREMENTS, THE CONTRACTOR SHALL PROVIDE, AS A MINIMUM, THE FOLLOWING RESPIRATORY PROTECTION FOR EACH PHASE OF OPERATION:

2.5.7.1 Pre-cleaning/Wet Wiping of Area: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.7.2 Polyethylene Installation: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.7.3 Asbestos Gross Removal and Cleanup: NIOSH full-face or PAPR respirators equipped with HEPA cartridges, or full-face supplied air, pressure demand respirators.

2.5.7.4 Asbestos Removal Glovebag: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.7.5 Non-Friable ACBM Removal: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.7.6 Polyethylene Removal (after Final Clearance): NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.7.7 Loading Waste Material on Truck (outside work area): NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.7.8 Unloading Bags at Landfill: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.

2.5.8 The above schedule is minimum respiratory protection acceptable. Should any condition, for any reason, be encountered where the exposure level, after application of the appropriate protection factor of the respiratory equipment in use, exceeds 0.01 f/cc, substitute respiratory equipment with protection factors which reduce worker exposure levels below 0.01 f/cc. Should any such condition come to the Consultant's attention, the right is reserved to require the use of respiratory equipment with higher protection factors for any or all phases of the work.

2.5.9 No visitors shall be allowed in work areas, except as authorized by the Consultant. Provide authorized visitors with suitable respirators whenever they are required to enter the work area.

2.5.10 When supplied air respirators are being used, one (1) open airline shall be maintained at all times for the Consultant's use.

2.5.11 Provide workers with sufficient sets of disposable protective full-body clothing. Such clothing shall consist of full-body coveralls, footwear, and head gear, one-piece coveralls or equal. Provide eye protection and hard hats as required by applicable safety regulations.

Reusable type protective clothing and footwear intended for reuse shall be left in the Contaminated Equipment Room until the end of the asbestos abatement work at which time such items shall be disposed of as asbestos waste. Disposable clothing shall not be allowed to accumulate and shall be disposed of as contaminated waste.

2.5.12 Provide authorized visitors with suitable protective clothing, headgear, footwear, and gloves as described above whenever they are required to enter the work area.

2.6 MATERIALS:

2.6.1 Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

2.6.1.1 Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

2.6.1.2 Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be disposed of in accordance with applicable regulations.

2.6.2 **POLYETHYLENE SHEETING:** A minimum 6-mil for floor and 4-mil for walls, in sizes to minimize the frequency of joints. All polyethylene sheeting shall be certified by the Underwriters Laboratory as being fire retardant.

2.6.3 **TAPE:** Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water. Duct tape, poly prep tapes or approved equal.

2.6.4 **ADHESIVES:** Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

2.6.5 **SURFACTANT:** Shall consist of 50% polyoxyethylene ether and 50% of polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration of one ounce of surfactant to 5 gallons of water. Prior to bidding, the Contractor shall be responsible for verifying that this surfactant is compatible with the materials to be removed and their substrates. If found to be incompatible, the Contractor shall supply suitable wetting agents at no extra cost to the Owner.

2.6.6 **IMPERMEABLE CONTAINERS:** Suitable to receive and retain any asbestos-containing or contaminated materials until disposal at an approved site. The containers shall be labeled in accordance with regulations. Containers must be both air and water tight and must be resistant to damage and rupture. An impermeable container shall be: 2 (two) 6-mil polyethylene bags or 1 (one) 6-mil polyethylene bag inside a drum with tightly fitting lid. Bags may be true 6-mil thickness, or have a tear resistance of M.D. 300 grams, T.D. 2,068 grams, and dart impact of 216 grams.

2.6.7 **WARNING LABELS AND SIGNS:** As required by regulations.

2.6.8 **GLOVEBAGS:** Manufactured device consisting of a bag constructed of 6-mil or thicker transparent polyethylene, two inward projecting long sleeve gloves, one inward projecting water wand sleeve, an internal tool pouch, and an attached, labeled receptacle for collection of removed asbestos waste. The glovebag is constructed and installed in such

a manner that it surrounds the object or area to be decontaminated and contains all asbestos fibers released during the removal process.

2.6.9 **ENCAPSULANTS:** A liquid material which, when applied, controls the possible release of asbestos fibers either by creating a membrane over the surface or by penetrating the material and binding its components together. The encapsulant shall be a commercial product which is color tinted.

2.6.10 **OTHER MATERIALS:** Provide all other materials, such as, but not limited to lumber, plywood, nails, and hardware, which may be required to properly prepare and complete this project.

2.7 TOOLS AND EQUIPMENT:

2.7.1 Provide suitable tools for asbestos removal.

2.7.1.1 Water Sprayer: Airless or a low-pressure sprayer for amended water application as applicable.

2.7.1.2 Air-Purifying Equipment: High Efficiency Particulate Air Filtration Systems (HEPA) shall comply with ANSI Z9.2-79. No air movement system or air equipment should discharge unfiltered air outside the work area. Thus, the negative air unit shall be equipped with a three-filter bank with the last being the HEPA filter capable of removing 99.97% of fibers >0.3 microns.

2.7.1.3 Paint/Encapsulant Sprayer: Airless or a low-pressure sprayer.

2.7.1.4 Scaffolding: As required to accomplish the specified work and meet all applicable safety regulations.

2.7.1.5 Vacuums: Use HEPA filtered type.

2.7.1.6 Other tools and equipment as necessary.

2.8 POSTING OF THE PROJECT:

Post warning signs in and around the work area to comply with OSHA regulation 29 CFR 1926.1101 and in compliance with all other Federal, State, and local requirements.

2.9 WORK AREA PREPARATION - OWNER:

2.9.1 The Contractor, in coordination with the Owner, shall shut down electric power to work areas. Electrical shutdown shall be coordinated with the Owner no less than seven Calendar days prior to the scheduled shutdown. The Contractor may use existing electrical service to the building for temporary electrical power during abatement work.

2.9.2 The Contractor, in coordination with the Owner, shall shut down or isolate heating, cooling and ventilating air systems to the work areas.

2.9.3 Before the work is begun, and unless otherwise specified, the Owner shall remove from

work areas all removable items and equipment not located on the asbestos material as specified. Owner shall later replace furniture and movable objects.

2.10 WORK AREAS PREPARATION - CONTRACTOR: Prior to commencing abatement work the Abatement Contractor shall prepare the work area as required by this specification and applicable regulations.

2.10.1 Pre-clean fixed objects within the work area, first using HEPA vacuum equipment and then wet cleaning methods as appropriate and completely enclose with minimum 6-mil thick plastic sheeting sealed with tape.

2.10.2 Prior to commencing abatement work, shut down and isolate heating, cooling, and ventilating air systems to prevent contamination and fiber dispersal to other areas of the building. Seal vents within the work area with tape and 6-mil plastic sheeting.

2.10.3 Clean the work area first using HEPA vacuum equipment and then wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not use HEPA vacuum equipment on wet surfaces unless units are specially constructed for wet/dry use. Do not use amended water on gypsum board or other material which would be damaged by the wetting agent. HEPA vacuuming or damp sponge with regular water would be appropriate.

2.10.4 Seal off all openings, including but not limited to windows, corridors, doorways, skylights, ducts, diffusers, and any other penetrations of the work areas, with 6-mil polyethylene sheeting sealed with tape. Open doorways and corridors with direct access to occupied areas shall be sealed with plywood in addition to the polyethylene barriers as described in this section.

2.10.5 Cover floor first and then wall surfaces with plastic sheeting completely sealed with tape at all edges with adhesive and tape at all joints. Use a minimum of two layers of 6-mil plastic on floors and all fixed horizontal surfaces. Cover floors first so that plastic extends at least 12 inches up on the walls, then cover walls with a minimum of two layers of 4-mil plastic sheeting which shall extend beyond wall/floor joints at least 12 inches. No seams shall be located at wall-to-floor joints. All polyethylene sheeting shall be certified by the Underwriters Laboratory as being fire retardant.

2.10.6 Install additional protection as necessary for floor finishes such as carpet and wood. The abatement contractor shall assume responsibility for all damage to floor finishes which occurs during the construction period.

2.10.7 Provide viewing windows as required by DSHS Regulations.

2.10.8 Build decontamination enclosure systems at the entrances to the work area.

2.10.9 All power supplied to the work area shall be GFCI protected.

2.10.10 Install negative air equipment.

2.10.11 Maintain and mark emergency exits from the work areas or establish alternate exits satisfactory to the local fire marshal.

2.11 DECONTAMINATION ENCLOSURE SYSTEMS:

2.11.1 **GENERAL:** The abatement contractor shall use portable decontamination units acceptable to EPA and OSHA, connected to the work area with framed-in or accordion tunnels, if necessary, and line the tunnels with plastic, sealed with tape at all joints in the plastic, or shall construct decontamination units on-site.

2.11.2 **ACCESS:** In all cases, access between any two rooms within the decontamination enclosure systems shall be through an air lock.

2.11.3 **WORKER DECONTAMINATION UNIT:** Construct or provide a worker decontamination unit contiguous to the work area consisting of three totally enclosed chambers as follows:

2.11.3.1 An equipment room with two curtained doorways, one to the work area and one to the shower room via an air lock.

2.11.3.2 A shower room with two curtained doorways, one to the equipment room and one to the clean room, via air locks. The shower room shall contain at least one shower per eight (8) workers with hot and cold or warm water with individual shut-off valves inside the showers. Careful attention shall be paid to the shower enclosure to insure against leakage of any kind. Drainage from showers shall be disposed of as contaminated water or filtered as specified below.

2.11.3.3 Waste water containing asbestos, including drainage from decontamination showers, shall be either disposed of as contaminated waste or filtered through 5-micron filters prior to introduction into the sanitary sewer system.

2.11.3.4 A clean room with one curtained doorway into the shower via an air lock and one entrance or exit to non-contaminated areas of the building. The clean room shall have sufficient space for storage of the workers' street clothes, towels, and other non-contaminated items.

2.11.4 **EQUIPMENT DECONTAMINATION UNIT:** Provide or construct an equipment decontamination enclosure system consisting of two totally enclosed chambers as follows:

2.11.4.1 A washroom constituting an air lock, with a curtained doorway to a designated area of the work area and a curtained doorway to the holding room.

2.11.4.2 A holding room, constituting an air lock, with a curtained doorway to the wash room and a curtained doorway to the uncontaminated area.

2.11.4.3 Contractor may elect to construct equipment decon unit on side of equipment room of worker decontamination unit.

2.12 SEPARATION OF WORK AREAS FROM NON-WORK AREAS:

2.12.1 Temporary barriers from corridors, doorways, and cased openings not to be used for passage during abatement shall be sealed with wood or metal studs, 16 inches O.C.,

faced with 3/8" plywood sheathing on the work area side only. Cover both sides of the partition with 6-mil polyethylene sheeting. Edges of the partition at floors, walls, and ceilings shall be taped air tight.

2.12.2 Separation of work areas adjacent to occupied areas shall require a barrier as described above.

2.12.3 Visual separation shall be accomplished at all "see-through" locations using opaque polyethylene. This separation shall not be incorporated within the other seals involved on this project. Provide viewing windows as specified by DSHS.

2.13 MAINTENANCE OF DECONTAMINATION ENCLOSURES:

2.13.1 At the beginning of each work shift and throughout removal, all seals and curtained doorways shall be inspected, and if not found in proper condition, repaired immediately.

2.13.2 Respiratory equipment shall be cleaned, repaired, and sanitized after each use.

2.13.3 Soap and shampoo shall be in the showers at all times.

2.13.4 Fresh towels shall be available at all times.

2.13.5 All areas shall be kept clean and in order.

2.13.6 Provide a disposal bag for contaminated filters in the shower room.

2.13.7 Provide storage for wet and dry towels.

2.13.8 Ensure that the drainage filtering systems are kept clean an operable at all times.

2.13.9 At the end of each decontamination period, the shower, air locks, and clean room shall be cleaned and dried.

2.13.10 At the end of each work shift: the two air locks and the shower shall be thoroughly disinfected; the filter bag (if applicable) shall be returned to the equipment room for disposal; the equipment room and first air lock shall be thoroughly HEPA vacuumed and wet cleaned.

2.14 WORKER PROTECTION:

2.14.1 All workers and authorized personnel, in order to enter the work area, shall:

2.14.1.1 Remove all clothing unless it is to remain in the equipment room for eventual disposal.

2.14.1.2 Don protective clothing (coveralls, gloves, boots, safety harness, etc.), as deemed necessary by the contractor's supervisor or safety officer.

2.14.1.3 Don the appropriate respiratory protection, following all training procedures and manufacturer's instructions. Hood shall be worn over respirator straps.

2.14.2 All workers and authorized personnel, in order to leave the work area, shall:

2.14.2.1 Remove gross (visible) contamination from themselves and their equipment.

2.14.2.2 Enter the equipment room and, keeping respirator in place, remove all protective clothing, including gloves and boots. Place contaminated clothing in the bag(s) provided. Store gloves and/or boots in their respective areas.

2.14.2.3 Still wearing the respirator, proceed naked to the first air lock. Once inside, ensure all curtained doorways behind are properly closed.

2.14.2.4 Respirator still in place, move into the shower room and rinse off thoroughly. If wearing dual cartridge respirators, make sure the cartridges are completely soaked before removing the respirator and disposing of cartridges in the container provided.

2.14.2.5 Complete showering, thoroughly soaping, and shampooing.

2.14.2.6 Proceed to the clean room, dry off, dress, and return respirator to the storage area.

2.14.2.7 No smoking, eating or drinking shall be allowed inside decontamination enclosures.

2.15 COMMUNICATIONS:

2.15.1 Provide an electronic communications system suitable for inside or outside, and inter-room communications, in order to monitor all activities within the work area and to readily transfer messages from one location to another.

2.16 FIRE EXITS:

2.16.1 Designate and maintain emergency and fire exits from the work area in accordance with local codes and regulations. All exits shall be clearly marked with fluorescent tape or red enamel and shall be clearly visible from any part of the work area.

2.17 SECURITY

2.17.1 Make all necessary provisions for 24-hour building security for areas designated for this project. The abatement contractor shall be responsible for maintaining security of the abatement areas throughout the contract period.

2.18 LOCATION AND ACTIVATION OF NEGATIVE AIR PRESSURE:

2.18.1 Maintain negative pressure system in the work areas during all asbestos abatement work for which abatement techniques are specified, or as required by the owner.

2.18.2 As a guideline, use the EPA document, Guidance for Controlling Friable Asbestos-Containing Materials in Buildings, June 1985.

2.18.3 Provide one spare negative air unit per site at all times. Spare exhaust units shall be of the same size and capacity as the largest operating units.

2.18.4 Suspend electrical cords off of the floor and out of workers' way to protect the cords from damage from traffic, sharp object, and pinching. Do not fasten cords with staples, and do not hang cords from nails or suspend with wire.

2.18.5 Provide sufficient number of negative air units in the work area to provide scrubbing of the air in the work area.

2.18.6 Locate units so that make-up air enters the work area primarily through the decontamination facility and traverses the work area as much as possible. Use section J.3 of the EPA Document, Guidance for Controlling Friable Asbestos-Containing Materials in buildings, Purple Book, June 1985.

2.18.7 Provide additional make-up air openings as shall be necessary to effectively move air through the work area and to avoid creating too high a pressure differential that would damage or cause blowing of temporary barriers and plastic coverings. Provide inlets by making openings in the plastic sheeting near the ceiling and as far as possible from the exhaust units. Provide self-closing polyethylene flaps over the openings to prevent backflow of air from the contained area to the outside.

2.18.8 Provide minimum number of auxiliary make-up air openings to maintain negative pressure. A negative pressure in excess of 0.02 inches of water differential, as measured by manometric measurements, shall be maintained.

2.18.9 Vent all exhaust units to the outside of the building at locations acceptable to the owner. Provide flexible or rigid duct as necessary to provide exterior venting and proper location of exhaust units. Ducts shall be completely sealed, in good repair, and protected from possible damage within the work area.

2.18.10 After the work area has been prepared, the decontamination set up, and the exhaust units installed, start the units (one at a time if more than one is Provided). Visually check the direction of air movement through the openings in the barriers and verify movement of air in all locations of the work areas by use of ventilation smoke tubes. Adjust the location of exhaust units or provide additional exhaust units for the work area if the test indicates inadequate or improper air movement.

2.18.11 After removal has begun, maintain operation of exhaust units continuously to maintain a constant negative pressure until decontamination of the work area is complete. Do not turn units off at the end of the work shift or when removal operations temporarily stop.

2.18.12 Change filters in exhaust units in accordance with manufacturer=s recommendations and paragraph J.3.22.1 of the EPA document, Guidance for Controlling Friable Asbestos-Containing Materials in Buildings, Purple Book, June 1985 or when there is obvious loss of negative pressure.

2.18.13 When a final inspection and the results of the final air monitoring tests indicate an acceptable level of airborne fibers, remove and dispose of pre-filters and shut off the

exhaust units. If the exhaust units are to be used in another work area leave the final filter in place and seal all intake openings to the unit to prevent contamination due to asbestos fibers collected on the final filter. If the exhaust units are not to be used in other work areas, remove the final filter and dispose of as contaminated waste.

2.18.14 If dismantling operations result in visible dust on surfaces, replace filters, restart exhaust units, re-clean surfaces and perform additional area air monitoring (At abatement contractor=s expense) until the level of airborne fibers is acceptable as specified.

2.18.15 Dispose of all filters as asbestos-contaminated waste material as specified.

2.19 EQUIPMENT REMOVAL PROCEDURES:

2.19.1 Clean external and internal surfaces of all nonfixed equipment and/or objects by thoroughly wet wiping and/or rinsing, before moving such items into the Equipment Decontamination Unit for final cleaning and removal to uncontaminated areas.

2.19.2 Objects and equipment removed shall be stored in areas designated by the Owner.

2.20 PREWORK INSPECTIONS:

2.20.1 All abatement work areas must be prepared by installing polyethylene barriers, negative air pressure, etc. as outlined in this specification. Upon completion of all work area preparation and four hours before work is to begin, notify Consultant that the work area is ready for inspection.

2.20.2 The abatement contractor shall not begin abatement work until the Consultant has inspected the area and any deficiencies have been corrected. Abatement work in accordance with the requirements in the following sections may proceed after the Consultant has approved of the work area preparation.

2.21 GROSS REMOVAL OPERATIONS:

2.21.1 Spray asbestos-containing material with amended water, using spray equipment capable of providing a "mist" application to reduce the release of fibers. Saturate the material sufficiently to wet it to the substrate without causing excessive dripping. Remove the saturated asbestos material in small sections from all areas. Material drop shall not exceed fifteen feet (15'). All asbestos-containing material shall be removed thoroughly and totally. No asbestos-containing material is to remain for any reason.

2.21.2 Insulation on pipes and other thermal system insulation to be abated within gross removal areas shall be removed using gross removal methods outlined in this section.

2.21.3 Provide shoring, bracing, and support as required to maintain structural integrity of materials and systems. Provide protection for other portions of project and protection from the elements. Protect existing electrical and electronic systems, cabling, and other components during all phases of abatement.

2.21.4 Install additional polyethylene barriers as needed during and after removal, in order to protect surfaces and maintain negative air pressure. After removal of ceilings, extend wall

polyethylene sheeting to deck above. Monitor negative pressure as the work progresses to evaluate the need for additional barriers and/or negative air equipment.

2.21.5 Material shall not be allowed to dry before placing in 6-mil polyethylene bags. Any contaminated material capable of puncturing the polyethylene bags shall be packaged separately in 6-mil polyethylene sheeting sealed with tape and/or glue, or fiberboard drums.

2.21.6 Maintain work areas free of accumulated asbestos-containing materials at all times. Keep waste materials wet until sealed in polyethylene bags.

2.21.7 Seal polyethylene bags air tight. Ensure that all contaminated materials, including insulation materials exposed by ceiling demolition, are bagged or wrapped to yield a minimum covering of two polyethylene layers, or sealed in fiberboard drums before removal from the work area. Bags may be true 6-mil thickness, or have a tear resistance of M.D. 300 grams, T.D. 2,068 grams, and dart impact of 216 grams.

2.21.8 Ensure that all disposal containers are properly labeled in accordance with regulations.

2.22 VINYL ASBESTOS TILE & MASTIC REMOVAL:

2.22.1 Removal of floor coverings utilizing the RFCI methods must comply with the requirements of published Resilient Floor Covering Institute methodologies and also requires the approval of the Project Consultant. Otherwise, use the methods outlined in this section.**2.22.2** Pre-clean the work area by first using HEPA-vacuum equipment, then wet cleaning methods until the area is visibly free of dust and debris.

2.22.3 Post warning signs which comply with regulations.

2.22.4 Establish a negative pressure enclosure in the work area utilizing critical barriers at all openings, decontamination unit, polyethylene sheeting on walls and negative air pressure equipment. Install a minimum of one layer of 6-mil polyethylene sheeting to a height of four feet on walls in the work area. The entire wall shall be covered with polyethylene sheeting in areas of ceiling removal.

2.22.5 Soak tiles with amended water for a sufficient time to allow removal intact with breakage kept to a minimum. Take precautions to contain water within the work area and prevent damage to areas outside the work area. Mist the work area and keep tiles wet during removal.

2.22.6 Remove mastic using approved chemical mastic remover. Substrate must be clean with no residue. No rotary equipment or sanding is allowed.

2.22.7 Floor coverings must be assumed to be multiple layered until field investigation proves otherwise. All such layers must be considered ACM or asbestos-contaminated and must therefore be removed.

2.22.8 Dispose of floor tiles as asbestos-containing waste in 6-mil plastic bags.

2.22.9 Dispose of chemical mastic remover as per manufacturer's instructions, Federal, State

and local regulations.

2.23 DISPOSAL OF ASBESTOS-CONTAINING WASTE (SOLID AND/OR LIQUID):

2.23.1 As the work progresses, to prevent exceeding available storage capacity on-site, workers from uncontaminated areas in full protective clothing and dual cartridge respirators shall enter the equipment decontamination unit and place the appropriate supply of specified containers within the holding room.
Workers in the holding room shall be passed sealed, double-bagged material. Bags may be true 6-mil thickness, or have a tear resistance of M.D. 300 grams, T.D. 2,068 grams, and dart impact of 216 grams. Dispose of waste materials or store at approved location. Ensure all curtained doorways are closed. Ensure that all containers are labeled and sealed properly before removing for transport and disposal. The color of the disposable clothing worn outside the work area shall be a different color than the disposable clothing worn inside the work area. At no time shall a removal worker pass the curtained doorway between the holding room and the wash room. Drums will not be required if abatement contractor uses sealed bins or enclosed trucks to store and transport bagged waste.

2.23.2 The exterior bag or fiberboard drum shall have warning and generator's labels applied as specified in 40 CFR 61.150(a)(1)(iv)-(v).

2.23.3 Prepare and sign the Waste Shipment Record (WSR) for each load of asbestos-containing waste transported off site. Ensure that the WSR is completed by the transporter(s) and waste disposal site operator.

2.23.4 Mark vehicles used to transport asbestos-containing waste material during the loading and unloading of waste in compliance with 40 CFR 61, Subpart M and during the transport of asbestos-containing waste in compliance with 49 CFR 171 and 172.

2.23.5 Vehicles used for transporting asbestos-containing materials to disposal sites shall have a completely enclosed, lockable storage compartment if drum requirement is to be deleted. Storage compartments shall be plasticized and sealed with a minimum of one (1) layer of 6-mil polyethylene on the sides and top and two (2) layers of 6-mil polyethylene on the floor. The compartments shall be thoroughly wet cleaned and/or HEPA vacuumed following the disposal of each load of material at the dump site. At the conclusion of the project (or before transport vehicles are used for other purposes), the polyethylene shall be properly removed and disposed of as contaminated waste. After this is accomplished, compartments shall once again be wet cleaned and/or HEPA vacuumed in order to eliminate all debris prior to being returned to the rental company. All plastic sheeting, tape, cleaning material, including mops and sponges, clothing, filters, and all other contaminated disposable materials shall be packaged, labeled, and disposed of as asbestos-containing waste.

2.23.6 Dispose of materials at an authorized disposal site in accordance with the requirements of federal, state and local disposal authorities.

2.23.7 Workers unloading waste material at the disposal site shall be dressed in full-body protective clothing and dual cartridge respirators.

SECTION 3 - CLEANUP PROCEDURES AND CLEARANCE STANDARDS

3.1 GROSS CLEANUP:

3.1.1 Remove all visible accumulations of asbestos-containing materials and debris by HEPA vacuums, sponging, etc. Wet clean all surfaces within the work area.

3.1.2 The entire work area shall be totally and visibly clean. The abatement contractor shall notify the Consultant of the time the work area will be ready for visual inspection, at least twelve hours in advance of the inspection. This inspection shall be certified by the abatement contractor and will be verified by the Consultant using the "Certification of Visual Inspection".

3.2 ENCAPSULATION OF WORK AREAS:

3.2.1 The work area shall have passed visual inspection prior to post-removal encapsulation. Negative air must continue to run.

3.2.2 An approved encapsulant shall be applied, using airless spraying equipment, to all areas of the project where asbestos-containing materials have been removed, except where such application will inhibit adhesion of new finishes.

3.2.3 ENCAPSULANTS:

3.2.3.1 The encapsulant shall be compatible with the replacement material as per manufacturer's advice.

3.2.3.2 If any encapsulant is incompatible with the substrate, the abatement contractor shall be fully responsible for providing an alternate encapsulant that is compatible, at no additional cost to the Owner.

3.3 FINAL CLEANUP:

3.3.1 After encapsulant has dried, carefully remove remaining wall and floor plastic, folding inward and sizing for proper disposal. Leave vent, window and door seals in place.

3.3.2 Using wet methods and HEPA vacuuming, clean the entire work area.

3.3.3 The entire work area shall be totally and visibly clean.

3.3.4 Contractor shall inform the Consultant that the area is ready for clearance testing.

3.4 FINAL CLEARANCE:

3.4.1 Clearance air monitoring samples shall be collected. If air sampling results for Final Clearance are less than or equal to 0.01 f/cc, the vent, door and other seals shall be removed and the areas behind them wet wiped and HEPA vacuumed.

3.4.2 Contractor shall remove decontamination unit, negative air equipment and any other materials associated with the abatement project.

3.4.3 After removal of all equipment and containment materials, the work area shall be inspected by the Contractor and the Owner's representative before being cleared for reoccupancy.

3.5 TESTING/AIR MONITORING:

3.5.1 Throughout the preparation, removal, cleaning and final clearance operations, air monitoring shall be conducted by the Consultant retained by the Owner to monitor Contractor's compliance with these specifications, and any applicable state and local regulations.

3.5.2 The abatement contractor shall provide, at his own expense, monitoring of his employees as required by 29 CFR 1926.1101(f).

3.5.3 **BASELINE MONITORING:** The Consultant will conduct area monitoring and establish the baseline ambient fiber concentrations prior to the precleaning operations for each removal site. Three 1250-liter samples minimum per site. PCM method will be utilized.

3.5.4 **MONITORING DURING ASBESTOS OPERATIONS:** The Consultant will conduct area monitoring inside the asbestos control area during the work shift. The consultant will conduct area monitoring outside the entrance to the asbestos control area and near the discharge of the local exhaust system. PCM method will be utilized in accordance with NIOSH 7400.

Areas to be Sampled	Number of Samples for each 8-hour shift - Typical	Sample Volume (in Liters) - Typical
Inside Work Area	2	480L
Outside work area but inside building (barriers, baselines)	1	1250L
Outside building near local exhaust	1	1250L
Reference exposure level	n/a	1250L
Quality Control	2	480L

3.5.5 **CLEARANCE MONITORING:** The Consultant will conduct a one phase aggressive air monitoring to establish the fiber concentration after completion of the visual inspection. Final air monitoring results shall be less than or equal to 0.01 f/cc by PCM analysis, and for quantities of 160 S.F. or 260 L.F. or more in schools, less than 70 Structures/square millimeters by TEM analysis.

3.5.6 **RE-TESTING:** If the clearance level is not achieved by the results of the first round of testing, the abatement contractor shall reimburse the Owner for retesting the area until clearance is achieved. The cost for testing and clearance samples will be assessed

against the abatement contractor's payments due on a Time and Materials basis.

3.5.7 **MONITORING RESULTS:** PCM analysis will be completed, and results reviewed by the Owner or the Consultant within 24 hours, within 12 hours for final compliance monitoring. The Consultant shall notify the abatement contractor and the Owner immediately if any fiber concentrations exceed acceptable limits. Analytical results are considered the Owner's property and use of these results for any purposes other than the final clearance will require the Owner's written approval.

3.5.8 Air monitoring for each glove bag and repair operation will be by personal sample collected on the worker to check for exposure level with reference to the baseline levels.

3.5.9 **CERTIFICATION OF VISUAL INSPECTION:**
The following Certification of Visual Inspection is a sample of the Form that shall be completed by the abatement contractor following the completion of the removal, cleanup and his visual inspection of the work area. The Consultant will provide a written list or a verbal explanation of deficient items if the certificate is rejected.

CERTIFICATION OF VISUAL INSPECTION

Building: _____

Project Number: _____

Specific Area: _____

CONTRACTOR CERTIFICATION

The abatement contractor hereby certifies that he or she has visually inspected the work area (all surfaces including pipes, beams, ledges, walls, ceiling and floor, decontamination units, sheet plastic, etc.) and all asbestos materials, including contaminated dust, debris, or residues have been removed in accordance with the contract documents.

By: (Signature) _____ Date: _____

(Print Name) _____ Title: _____

Company Name: _____

CONSULTANT CERTIFICATION

The Consultant hereby certifies that he or she has accompanied the Contractor on his visual inspection and verifies that this inspection has been thorough and to the best of his knowledge and belief, the Contractor's certification above is a true and honest one.

The final air sampling has been completed and the sample results meet the criteria for re-occupancy established by the Contract Documents. The final air samples were analyzed by: __X__ PCM or __TEM. Clearance air sample numbers are:

_____

By: (Signature) _____ Date: _____

(Print Name) _____ Title: Project Manager

Jennifer Phillips, Amber Bivens, Sean Porter, Toyin “Sam” Keshinro, Clement Uwaka, Jarrold Ardoin, Faith Oladejo, Olatunde Oladunjoye, and Roger Green are EPA accredited and DSHS licensed Project Managers authorized by the project consultant to perform clearance inspections and clearance testing for asbestos abatement work areas.

PCM = each sample is less than or equal to 0.01 f/cc
TEM = average of samples is less than or equal to 70 s/mm^2 (AHERA)

SECTION 01 1000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

01 Project information.
02 Work by Owner.
03 Work under separate contracts
04 Owner furnished, Owner Installed (OFOI) products.
05 Owner furnished, Contractor Installed (OFCI) products.

1.2 PROJECT INFORMATION

A. Project Name and location:
Cimarron Elementary School Replacement
816 Cimarron Street, Houston, Texas 77015

B. Owner: Galena Park Independent School District
01 Owner Representative: Edgardo S. Martir

C. Architect: S. Chu Architects, Inc.
01 Mailing Address: 1300 W Sam Houston Pkwy S, Suite 121, Houston Texas 77042
02 Contact: Madeline Chu
03 E-Mail: smchu@earthlink.met
04 Telephone: 281-961-0355

D. Architect's Consultants. The architect has retained the following design professionals who have prepared designated portions of the Contract Documents.
01 Civil Engineer- Talon Engineering
02 Structure Engineer- CJG Engineers
03 MEP Consultant- Stanton Engineer Group, LLC
04 Food Service- Foodservice Design Professionals
05 Landscaping- Vitro Design Studio LLC

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The work of Project is defined by the Contract Documents and consists of replacing the existing Cimarron Elementary School. The existing Cimaarron Elementary School shall remain in operation until the New School is substantially completed.

B The work includes, but is not limited to, demolition, concrete, structural steel, masonry, metal stud walls, tiling, acoustical treatment, stage curtains, food service equipment, mechanical, plumbing, electrical, fire alarm, sound, and security systems. Total approximately 114,000 sq. ft.

1.4 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

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1.5 OWNER FURNISHED; OWNER INSTALLED PRODUCT (indicated as N.I.C.):

A. Movable furniture

B. Computers

1.6 OWNER-FURNISHED, CONTRACTOR-INSTALLED (OFCI) PRODUCT.

A. Toilet Room Accessories as shown.

B. Residential Appliances where shown.

C. Network Electronics

D. Network Equipment UPS Systems

E. Wireless Access Point

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

A. The Owner has a critical need for the Work to begin upon Notice to Proceed and obtain the Certificate of Temporary Occupancy from COH for the New School by May 20, 2027. Demolition of existing facility, drives, paving, parking, drainage, detention, landscaping and fencing to be substantial complete by Sept. 20, 2027. Final Completion and Certificate of Occupancy from COH by Dec. 31, 2027. See Supplemental Conditions to the General Conditions for Liquidated Damages.

END OF SECTION

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SECTION 01 1400

WORK RESTRICTIONS

PART 1 - GENERAL

1.01 THIS SECTION INCLUDES:

A. Access to site.

B. Coordination with occupants.

C. Work Restrictions

D. Worker Conduct and Appearance- work rules

E. Project Utility Sources

1.02 ACESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operation.

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.

C. Keep driveways and entrances serving premises clear and available to Owner, Owner's employees and emergency vehicles at all times.

D. Do not use drives and entrances for parking or storage of materials.

E. Schedule delivery not interfere with School operations, coordinate with the Owner.

F. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.

1.03 COORDINATE WITH OCCUPANTS

A. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to day operations.

B. Provide not less than 72 hours in advance of activities that will affect Owner's operations.

1.04 WORK RESTRICTIONS

A. Full school operation will be conducted at normal school days at existing Cimarron Campus.

B. No delivery is allowed during arrival and dismissal hours on school days. Coordinate with the Owner.

C. During construction, limit the construction activities in area shown.

D. Work at existing campus is allowed during weekends, holidays and before and after-hours during School Days. Coordinate schedule with the Owner.

E. Existing Underground Utilities under the proposed Addition: Existing underground sewer lines shall be rerouted and completed before excavation begins. Provide temporary sewer lines for existing buildings prior to permanent sewer lines are complete. It is the contractor's responsibility to include all cost incurred, no extra shall be paid by Owner for maintaining the sewer lines in operation during occupied time.

F. Existing Utility Interruptions: Contact Mr. Martir, Director of Construction & Facilities, at least 72 hours ahead of any required interruption of services. No interruptions of service shall be made without the express consent of Galena Park ISD.

1.05 WORKERS CONDUCT AND APPREARANCE- WORK RULES

A. Use of Tabaco products and other controlled substances on Project site is not permitted.

01 Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable window or outdoor-air intakes.

02 Possession of firearms or ammunition on Project site is prohibited.

03 No contact with staff or students is allowed in occupied school. Provide solid barriers between construction activities and students area.

04 All workmen shall be fully clothed and shall exhibit acceptable behavior at all times. Association with building tenants will be prohibited. Failure to comply with these requirements will subject to personnel to banishment from property to prosecution to full extent of the law.

05 Galena Park ISD will provide photo badges for all General Contractor personnel on site. All subcontractors working within existing facility must have finger printed and photo identification badges.

1.06 PROJECT UTILITY SOURCES

A. Major utility companies:

01 Electrical Service

Center Point Energy- Baytown Service Area 281-425-7352

02 Gas Service

Center Point Energy- Roger Kista 281-821-1666

03 Water and Sewer- City of Houston

04 Telephone- AT&T

05 Data/Video Cabling- Comcast

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The following CASH ALLOWANCES shall be included in the Base Proposal. These sums shall be reconciled per Article 4.8 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. 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 sum, and not in the allowance. 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. If the cost, when determined, is more than or less than the allowance, the Contract sum shall be adjusted accordingly by Change Order, which will include additional handling costs on the site, labor, installation costs, overhead, profit and other expenses resulting to the Contractor from any increase over the original allowance.

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

PART 2 - ALLOWANCES

2.1 ITEMS

A. **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.

Allow the sum of $750,000.00 for Contingency..... $750, 000.00

B. Graphics:
Contractor shall include in the Base Proposal the following sums as graphics allowance to cover the cost of painted wall graphics, additional signages not included in the Base Proposal.

Allow the sum of $100,000 for Graphics……$100,000.00

END OF SECTION

SECTION 01 2500

SUBSTITUTION PROCUDURES

PART 1 - GENERAL

1.01 PRODUCT SUBSTITUTION PROCEDURES

A. Products are specified by reference standards, performance and manufacturer's name and model number or trade name.

1. When specified only by reference standard or performance, Contractor may select any product meeting specified standards or performance requirements, by any manufacturer.
2. When several products or manufacturers are specified as being acceptable, Contractor has the option of choosing among those named.
3. When one product or manufacturer is specified or indicated as the "basis of design", "basis of selection" or "scheduled", Contractor shall bear costs associated with changes required for application or installation of other products or assemblies.
4. When proprietary products are specified, substitutions will be allowed only by substitution provisions specified herein.

B. Contractor shall make written application. The burden of proving equality or proposed substitutions rests with the party making the request for substitution.

1. Request for substitution shall reach the Architect no less than 7 calendar days prior to the date set for opening of proposals. Requests received after this date will not be considered.
2. Requests for substitution shall be accompanied by such technical data and samples as the party making the request desires to submit. Architect will consider reports from independent testing laboratories, verified experience records from previous users, and other printed or written information valid in the circumstances.
3. Requests for substitution shall indicate in what respects proposed materials or products differ from those specified and the effect on interfacing or related work.
4. Request for substitution shall be accompanied by the manufacturer's dated product data describing the installation, use and care, as applicable, of proposed substitution. Include reference standards, test data and clarification drawings.
5. Request for substitution shall be accompanied by complete cost data indicating material cost, installed cost and savings, if any, resulting from proposed substitution.
6. Determination as to acceptability of proposed substitutions will be made based only on data submitted.
7. Contractor shall coordinate installation of accepted substitutions with interfacing work, bearing redesign costs and making approved changes in the Work to properly incorporate the substitutions, and shall waive all claims for additional costs related to use of acceptable substitutions which become apparent following acceptance.

C. An addendum will be issued to Proposers not less than four days prior to the date set for opening of proposals if a proposed substitution is accepted by Architect. Unless substitutions are received and approved as described above, the successful Proposer shall be responsible for furnishing materials and products in accord with the Contract Documents.

D. In the event that specified items cannot be delivered to the job site and incorporated into the Work at such times and in such quantities as to cause no delay, then Contractor may request a substitution in the manner described above. Should the accepted substitution provide a cost savings, the Contract price will be adjusted by Change Order, with Owner receiving the benefit of the net savings. No increase in the Contract price will be allowed on substitutions made after award of Contract, except where the Contractor can verify a timely placement of orders appropriate to the materials and conditions involved.

E. Inability to obtain specified items due to Contractor's failure to place timely orders will not be considered reason for authorizing substitutions.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION

SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.02 MINOR CHANGES IN THE WORK

A. Architect will issue "Minor Change" authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time on Architect's form.

1.03 PROPOSAL REQUESTS

A. Owner-Initiated Proposed Change: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time using Architect's Form "Change Proposal Request". If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposed Changes issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposed Change or with reasonable promptness, when not otherwise specified, after receipt of Proposed Change, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Include updated Submittal Schedule showing effect of the change.

B. Contractor-Initiated Proposed Change: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect using Contractor's Standard Form.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Include updated Submittal Schedule showing effect of the change.

7. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.04 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: If applicable, Architect will issue “Allowance Expenditure Authorization” for adjusting the Contract Sum to reflect actual costs of allowances.

1.05 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposed Change, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 2900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 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 on for Payment forms
b. Submittal schedule.
c. Accepted Alternates.

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.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments; provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work; provide subschedules showing values coordinated with each element.

B. Format and Content: The Schedule of Values shall be broken down into two categories: Phase 1 and Phase 2. Each category shall be further broken down with each item costs for each specification section as labor and materials as a minimum. After review by the Architect, the Schedule of Values shall be broken down into further items as required.

1. Itemize the following items in addition to Specification sections.

a. Mobilization
b. Building Permit
c. Bonds, Insurance
d. General Conditions
e. System Training
f. Project Close-out Documents and O&M Manuals

2. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
3. Allowances (If Applicable): Provide a separate line item in the schedule of values for each allowance.
4. Alternates (If Applicable): Provide a separate line item in the schedule of values for each accepted alternate.
5. Change Orders: Provide a separate line item in the schedule of values for each change order.
6. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the schedule of values.

7. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 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: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. If the Agreement does not state payment dates, establish dates at preconstruction conference.
2. Submit draft, or pencil, copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Unless directed otherwise by Owner, use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: If accepted by Owner, include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored on site, but not yet installed. All materials must be stored on Site. Materials stored off site will not get paid.

F. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. With each Application for Payment, submit Affidavit of Payment of Debts and Claims for construction period covered by the previous application.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

I.

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.

J. 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. When applicable, this application shall reflect Certificate(s) of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. If applicable, final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

1.2 DEFINITIONS

A. Project communications documents shall be defined as the following:

1. Letters.
2. Memoranda.
3. E-Mail Communication
4. RFI (Request for Information - Contractor).

1.3 FORMAT

A. Letters and Memoranda: Submit in formats acceptable to the Architect.

B. E–Mail Communications/Internet Communications/Project Management Software Communications: Submit in forms and formats acceptable to and as approved by the Architect.

C. RFI (Request for Information - Contractor): Submit on forms furnished by the Owner, or on other forms as approved by Architect/Owner.

1.4 PROJECT COMMUNICATIONS DOCUMENTS

A. Letters and Memoranda documents shall be submitted in a timely manner so as to facilitate project delivery and coordination. Routing of communications shall be as established in the Contract, the Contract Documents and the Pre-Construction Conference. Communications documents shall be transmitted or forwarded in a manner consistent with the schedule and progress of the work.

B. E–Mail Communications, Internet Communications, and Project Management Software programs must be compatible with the Architect's and Owner's computer systems and equipment. The responsibility for all costs for management of these systems, including, but not limited to, licensing, onsite training or other training necessary for the proper operation of such systems, shall be by the Contractor. The Contractor shall keep written records and hard file copies of all electronic communications. Failure of the Contractor to keep such records shall waive the Contractor's right to rely on such communications and such communications shall be deemed to have not taken place.

C. RFI (Request for Information - Contractor) shall be defined and limited to a request from the Contractor seeking interpretation or clarification of the requirements of the Contract Documents. Such requests shall comply with the following requirements:

1. RFI requests shall be submitted in a timely manner, well in advance of related work, and allow sufficient time for the resolution of issues relating to the request for interpretation or clarification. Contractor shall schedule the submission of RFI's so as to moderate and manage the flow of RFI requests. RFI's shall be submitted in a manner consistent with the schedule and progress of the work, and shall not be submitted in a sporadic and/or excessive manner.
2. RFI requests shall be numbered in a sequential manner and contain a detailed description of the areas of work requiring interpretation or clarification. Include drawing and specification references, sketches, technical data, brochures, or other supporting data as deemed necessary by the Architect, for the Architect to provide the interpretations and clarifications requested.

    a. The Contractor shall include a "Proposed Solution" to the issue requiring interpretation or clarification.

3. RFI's submitted to the Contractor by Sub-Contractors, vendors, suppliers, or other parties to the work shall be reviewed by the Contractor prior to submission to the Architect. If the Architect deems that such RFI requests have not been adequately reviewed by the Contractor, such requests will be returned to the Contractor for further action. Sub-Contractor's RFI shall contain a "Proposed Solution".
4. RFI requests shall not contain submittals, substitutions requests, routine communications, correspondence, memos, claims, or any information required by other areas of the Contract Documents. RFI requests containing such information will be returned to the Contractor without action by the Architect.
5. RFI requests are limited to a request for interpretation or clarification of the requirements of the Contract Documents. Interpretations provided by the Architect shall not change the requirements of the Contract or the Contract Documents. If the Contractor determines that the Architect's response to an RFI gives cause for a change in the Contract or the Contract Documents, the Contractor shall promptly, within 5 working days, give written notice to the Architect of request for adjustments. Requests for adjustments to the Contract shall be submitted in a manner consistent with the terms and conditions of the Contract Documents.
6. If the Architect, after review, determines that any RFI has been submitted in an incomplete manner, is unnecessary, or does not otherwise comply with the requirements of this Section, the RFI will be returned without action to the Contractor. The Contractor shall delete the original submittal date from the RFI log and enter a new submittal date at the time of re-submittal.
7. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of Project Web site. Software log with not less than the following:

    a. Project name.
    b. Name and address of Contractor.
    c. Name and address of Architect.
    d. RFI number including RFIs that were returned without action or withdrawn.
    e. RFI description.
    f. Date the RFI was submitted.
    g. Date Architect's response was received.

8. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

    a. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

D. RFI-A (Request for Information - Architect) shall be defined as a request by the Architect for information relating to the obligations of the Contractor under the Contract.

1. After receipt of an RFI-A the Contractor shall provide a written response to the Architect within 5 working days. Responses shall be thorough, complete and shall contain all information requested by the Architect.

2. An RFI-A shall be limited to a request by the Architect for information related to the project. The RFI-A shall not be construed as authorizing or directing a change in the Contract or the Contract Documents.

E. Revisions to Construction Documents: Responses to requests for information (RFI) shall not serve as construction documents; and the Contractor shall not incorporate RFI responses into construction of the Project, unless such answers bear the seal and signature of a licensed design professional.

1.5 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and Project Web site. Keep list current at all times.

1.6 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Issue Daily Field Report.

7. Preinstallation conferences.
8. Project closeout activities.
9. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.7 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    e. Indicate required installation sequences.
    f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
3. BIM File Incorporation: When applicable, develop coordination drawing files from Building Information Model (BIM) established for Project.

    a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in Autodesk Revit and/or Autocad; and compatible with Microsoft Windows operating system.
    c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

1.8 PROJECT MEETINGS

A. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, and coordination with adjacent activities. Prepare agenda appropriate to Work.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, at a time to be decided prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. If applicable, requirements for completing sustainable design documentation.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. If applicable, coordination of separate contracts.
    l. If applicable, Owner's partial occupancy requirements.
    m. Installation of Owner's furniture, fixtures, and equipment.
    n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

D. Progress Meetings: Conduct weekly progress meetings at field office.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following or as needed:

        1) Interface requirements.
        2) Sequence of operations.
        3) If applicable, resolution of BIM component conflicts.
        4) Status of submittals.
        5) If applicable, status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.
        9) Site utilization.
        10) Temporary facilities and controls.
        11) Work hours.
        12) Hazards and risks.
        13) Progress cleaning.
        14) Quality and work standards.
        15) Status of correction of deficient items.
        16) Field observations.
        17) Status of RFIs.
        18) Status of proposal requests.
        19) Pending changes.
        20) Status of Change Orders.
        21) Documentation of information for payment requests.

4. Minutes: Owner will compile the meeting minutes and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings on an as-needed basis. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) If applicable, resolution of BIM component conflicts.
        4) Status of submittals.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site utilization.
        9) Temporary facilities and controls.
        10) Work hours.
        11) Hazards and risks.
        12) Progress cleaning.
        13) Quality and work standards.
        14) Change Orders.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 3216

CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 THIS SECTION INCLUDES:

A. Construction Schedule

PART 2-SCHEDULE SUBMITTALS

2.01 REQUIREMENTS

A. Within 3 weeks after the Notice to Proceed, submit a detailed Critical Path Schedule by using Microsoft Project or equivalent by the Contractor, and shall us precedence format with activity numbers on a reasonable, rational system for identification purposes.

B. Durations shall be in working days and appropriate to the activity.

C. The schedule submitted shall reflect complete sequence of construction by activity including submittal activities, product procurement, testing of materials and equipment, cleanup, initial and final inspection and punch list corrections.

D. Approved by the Owner and Owner's Representatives of the Contractor's Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the work within each and every Contract-required Milestone and Completion date. Omissions and errors in the approved Construction Schedule shall not excuse performance, which is not in compliance with the Contract. Approved by the Owner and Owner's Representatives in no way makes the Owner or Owner's representatives an insurer of the Contraction Schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner or Owner's Representatives approval of or acquiescence to the Construction Schedule.

E. It is to be expressly understood and agreed by the Contractor that the schedule is an estimate to be revised from time to time as progress proceeds, and that the Owner does not guarantee that Contractor can start work activities on the early or late start dates or complete work activities on the early finish or late finish date shown in the schedule, or as same may be updated or revised, not does the Owner or Owner's Representatives guarantee that Contractor can proceed at all times in the sequence established by said schedule. If Contractor's schedule indicates that Owner or a separate contractor is to perform an activity by a specific date, or within a certain duration, Owner or any separate contractor under contract with Owner shall not be bound to said date or duration unless Owner expressly and specifically agrees, in writing to same; the Owner's and/or the Owner's Representative's overall review and approval or acceptance of the schedule does not constitute an agreement to specific dates, duration or sequences for activities of the Owner or any separate contractor.

2.02 UPDATED SCHEDULE

A. Weekly- provide the current Construction Schedule at each weekly progress meeting.

B. Monthly- Provide a current detailed Construction Schedule with each Application for Payment.

C. If the Schedule is not acceptable to the Owner, the Contractor will revise the Schedule until it is acceptable to the Owner.

END OF SECTION

SECTION 01 32 23
SURVEY AND LAYOUT DATA

PART 1 G E N E R A L

1.01 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.

1.02 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit the 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.

1.03 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.

1.04 EXAMINATION

A. Verify locations of survey control points prior to starting the Work.

B. Notify the Owner's Representative immediately if any discrepancies are discovered.

1.05 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 the 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.

1.06 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.

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 01 32 23

SECTION 01 3300

SUBMITTALS

PART 1 - GENERAL

1.1 PROCEDURES

A. Transmit each item with approved form identifying project, contractor, subcontractor, major supplier; identify pertinent drawing sheet and detail number and specification section number, as appropriate. Identify deviations from Contract Documents.

B. Apply Contractor's stamp, signed, to each item submitted, certifying that review and verification of products, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and Contract Documents.

C. Revise and resubmit submittal as required; identify all changes made since previous submittal.

D. After review, distribute copies to all concerned parties.

1.2 SHOP DRAWINGS AND PRODUCT DATA

A. Submit four (4) prints of shop drawings and five (5) sets of product data and brochures or electronic copy.

1.3 SAMPLES

A. Submit full range of manufacturer's standard colors, textures, and patterns for Architect's selection. Submit samples for selection of finishes in accordance with approved schedule, in such sequence as to cause no delay in the work or in the work of any other Contractor.

B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

C. 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

D. Resubmission Requirements for Samples:
   01 Make any corrections or changes in the submittals required by the Architect and resubmit until approved.
   02 Submit new samples as required for initial submittal.

E. Manufacturer's Instructions
   01 When work is specified to comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation including two copies to Architect at least two weeks prior to start of such work.

F. Submit the number specified in respective Specification section; minimum of two, one will be retained by Architect. Reviewed samples may be used in the Work if so indicated in the specification section.

1.4 MANUFACTURER'S CERTIFICATES

A. Submit required certificates in duplicate.

END OF SECTION

SECTION 01 4100

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. **Section includes**:

1. Permit and fees.
2. Code and regulatory compliance for the associated work.
3. NPDES requirements.

1.02 PERMIT AND FEES

A. The Contractor will pay for all County, City and/or State Building permits and other building fees related to the project. The Contractor and Subcontractors will be responsible for obtaining all required trade permits or license fees.

B. Utility Service Fees and impact fees will be borne by the Owner.

1.03 BUILDING CODES

A. Applicable building codes are listed on the drawings.

B. Contractor shall provide, at the jobsite office, the approved permit set.

1.04 NPDES REQUIREMENT

A. The Contractor shall be responsible for implementation, maintenance and inspection 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 practices shown on the drawings.

B. The Contractor shall review implementation of the Storm Water Pollution Prevention Plan (SWPPP) with the required municipal authority prior to start of construction.

C. The Contractor shall prepare and sign documentation in accordance with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) permit as stated in the Federal Register Vol. 57, No. 175, issued by the Environmental Protection Agency on September 9, 1992.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 4529

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall allow in his proposal the coordination and supervision of tests to be performed by an independent laboratory selected by the Owner.

B. All testing laboratory services shall be provided and paid for by the Owner outside of this Contract. A testing lab shall be selected by the Owner, and the Contractor shall be notified as soon as possible.

C. The Owner will pay for the initial laboratory services of materials that comply with the requirements of the Contract Documents. The Contractor shall pay for testing and retesting of materials that do not comply with the requirements of the Contract Documents.

D. 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.

1.2 RELATED REQUIREMENTS

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals, or public authorities.

B. Respective Sections of Specifications: Certification of products.

C. Each Specification Section Listed: Laboratory test required and standards for testing.

D. Testing laboratory inspection, sampling and testing is required for:
   01 Division 31 - Earthwork
   02 Division 31 - Trenching and Backfilling
   03 Division 31 - Soil Stabilization
   04 Division 3 - Cast-In-Place Concrete
   05 Division 3 - Insulating Concrete
   06 Division 4 - Unit Masonry
   07 Division 5 - Structural Steel
   08 Division 7 – Modified Bitumen Roofing
   09 As requested by the Owner or Architect

1.3 AUTHORITIES AND DUTIES OF THE LABORATORY

A. 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. 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 General Contractor, Architect, supplier and/or subcontractor providing or preparing the materials or work being tested of such deficiencies.

B. 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 General Contractor. 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.

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. No compensation will be considered for these reviews.

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. There will be a three-hour minimum for each scheduled testing service. Vehicle charges will be included on a $25.00 per trip basis.

G. Cylinder pick-up will be handled by the technician performing the test on a scheduled pick-up day. If there are no testing services scheduled, the cylinder pick-up fee will be $40.00 on week days, and $50.00 on weekends and holidays, with no technician time or vehicle charge.

H. 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.

I. 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 TESTS CONDUCTED

A. Earthwork:

01 Subgrade under building slabs and paving.

a. In place density tests for each 2,500 sq. ft. of existing subgrade material.

02 Select earth fill and fill under building slabs and paving.

a. 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.

b. In place density test for each 2,500 sq. ft. of compacted new fill material, ASTM D2922 or AASHTO T99.

c. Liquid limit of fill material, ASTM D423 or AASHTO T89.

d. Plastic limit and plasticity index of all fill material, ASTM D424 or AASHTO T90 and T91.

e. Refer to structural and civil drawings for additional requirements.

03 Soil Stabilization:

a. Various tests relative to the requirements of Texas Highway Department Standard Specification for Construction of Highways, Streets and Bridges.

04 References:

a. American Society for Testing and Materials
ASTM D423
ASTM D424-59 (1971), Plastic Limit and Plastic Index of Soils
ASTM D698-78, Measure-Weight Relations of Soils and Soil Aggregate using 5.5 lbs. (2-49-KG) Rammer and 12-in. (305 mm) drop.
ASTM D2922-71 (1976)

b. American Association of State, Highway and Transportation Officials
AASHTO T89-76, Determining the Liquid Limit of Soils
AASHTO T90-70, Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T91
AASHTO T99-74, Moisture-Density Relations of Soils

B. Cast-In-Place Concrete:

01 Design concrete mixes and test aggregates proposed for use therein.

02 Determine the quality of the concrete as outlined in ASTM C-L143.

03 Provide full time services for the review of all drilled pier foundation inspections. Including a daily report noting grid lines and locations of each pier drilled. After the foundation shaft has been drilled, the lab shall test an undisturbed sample and verify that it meets or exceeds the design specification.

04 Provide full-time services for all structural building concrete drilled piers, grade beams, slab on grade, columns, and other miscellaneous structural concrete. Included within this scope of work is the review of all the rebar placement, size, spacing of stirrups, and miscellaneous placement requirements.

05 Cast two (2) concrete cylinders for every 50 cubic yards of structural concrete for compressive strength testing. Cast three (3) concrete cylinders for every 100 cubic yards of building slab and concrete paving for compressive strength testing.

06 Reference: American Society for Testing and Materials ASTM C143, Slump of Portland Cement Concrete

07 Refer to Structural Drawings for additional requirements.

C. 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 by Owner; 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.

03 Refer to Structural Drawings for special testing required by the City of Houston.

D. Lightweight Insulating Fill: Test in accordance with ASTM C495

01 Types of Tests:

a. Field: Wet density

b. Lab: Dry density and 28-day compressive strength

02 Number of Test Sets:

a. One per 5,000 square feet.

b. Not less than one for each day's work

E. Roofing (if requested by Architect/Owner) during construction, before final completion of building.

01 Time: Any time during construction before final completion of building, refer to Modified Bitumen Roofing Section - 075216.

02 Size: Cut 4” x 36” strip across roof plies.

03 Inspection: Architect may use samples for confirming number of plies, bonding of plies, weight of bitumen and softening temperature.

04 Patching: Fill in area where samples have been removed with plastic cement of other filler. Hot mop patch plies to overlap each other so sample area becomes equal to typical roof.

05 Number: As directed by Owner/Architect.

F. Masonry Testing: Provide pre-construction and construction evaluation of mortars per ASTM C780-87. See Structural Drawings for testing required.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 GENERAL REQUIEMENTS

A. Temporary facilities shall only be for the duration of construction, unless noted otherwise, and all temporary facilities shall be completely removed at the completion of the project. Any areas disturbed by the placement of temporary facilities shall be repaired/replaced to a finished condition consistent with the surrounding finished area.

1.02 TEMPORARY UTILITIES

A. The Contractor is responsible for providing and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes including review and inspection of work.

B. Existing facilities may not be used unless approved by Owner.

C. Sanitary Toilet Facilities: provide and maintain temporary toilet facilities at each site for construction personnel. Sanitary facilities shall meet standards of Building Code. Permanent existing and new facilities my not be used by personnel.

1.03 FACILITIES

A. Temporary Offices.

1. The Contractor shall provide a weather-tight field office building with lighting, electrical outlets, heating, cooling equipment and equipped with sturdy furniture and drawing display table.
2. Provide an office for the contractor and a meeting space with table and chairs to accommodate 6 persons. Provide flush toilet facility for use by Owner and make arrangements for daily services.
3. Locate office a minimum distance of 40 feet from existing and new structures.

B. Telecommunications Services:

1. Windows-based personal computer dedicated by project telecommunications, with necessary software and laser printer.
2. Internet Connections: minimum of one, DSL modem or faster.
3. Email: Account/access reserved for project use.

C. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
2. Use of existing facilities is not permitted.
3. New permanent facilities may not be used during construction operations.
4. Maintain daily in clean and sanitary condition.
5. At end of construction, return to same or better condition as originally found.

D. Temporary Storage Facilities: Provide weathertight storage sheds with raised floors. Sheds shall be of type and size required by storage conditions. Locations and adequacy of storage facilities shall be subject to Architect's acceptance.

E. Temporary Barriers

1. Provide barriers to prevent unauthorized entry to construction areas. Protect existing facilities and adjacent properties from damage from construction operations and demolitions. Implement safety precautions that comply with all regulatory requirements.
2. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
3. Provide protection for plants designated to remain. Replace damaged plants.
4. Protect non-owned vehicular traffic, stored materials, site and structures from damage.
5. Maintain required exits from the existing school. Provide temporary exists and barriers as required by the Fire Marshall.

F. Temporary Construction Fence

1. Provide a temporary construction fence, enclosing project site, equipment with vehicle, and acceptable to the Owner. Fence shall be 6’-0” high, commercial grade chain-link fence.
2. Provide gates as required for Contractor’s operations. Gates shall be of same height as fencing. Keep gates locked at all times other than normal construction hours. Furnish a set of gate lock keys to the Owner.
3. On sites where students are present, no work shall commence prior to fence being in place.
4. Maintain fence until building is enclosed, outdoor storage areas are no longer in use and finish grading is begun, unless otherwise directed by the Owner.

G. Site Access and Parking:

1. Provide and maintain temporary all-weather access to building site.
2. Provide parking for construction personnel shall be in locations acceptable to the Owner.
3. Provide and maintain temporary access to Pad-mount Transformer as required by Center Point.

H. Project Identifications

1. No signs are allowed without Architect’s permission except those required by law.

1.04 SECURITY

A. Provide security and facilities to protect work, existing facilities and School’s operations from unauthorized entry, vandalism or theft.

B. Coordinate with Owner’s security program.

1.05 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Designated existing on-site roads may be used for construction traffic.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide off-site parking.

F. Do not allow vehicle parking on existing pavement unless approved by the Owner.

1.06 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. If materials to be recycled or re-used on the project must be stored on-site, provide suitable and secure non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of authorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

A. Provide temporary partitions as indicated to separate work areas, to occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: framing and plywood sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1. STC rating of 35 in accordance with ASTM E90
2. Maximum flame spread rating of 25 in accordance with ASTM E84.

C. Paint surfaces exposed to view from occupied areas.

1.09 REMOVAL OF UTILTIES, FACILITIES AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to final punch list and review inspection.

B. Remove underground installation to a minimum depth of 3 feet. Grade site as indicted.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition

E. Restore new permanent facilities used during construction to specified condition.

PART 2- **PRODUCTS (NOT USED)**

PART 3- EXECUTION (NOT USED)

END OF SECTION

SECTION 01 55 13.10
STABILIZED CONSTRUCTION ENTRANCE

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Installation of erosion and sediment control for stabilized construction exits 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 UNIT PRICES

A. Unless indicated in the Unit Price Schedule as a pay item, no separate payment will be made for work performed under this Section. Include cost of work performed under this Section in pay items for which this work is a component.

B. When indicated in the Unit Price Schedule, include stabilized exits under payment for Street Cleaning as Required by NPDES, including stabilized construction roads, parking areas, exits, and truck washing areas will include and be full compensation for all labor, equipment, materials, supervision, and all incidental expenses for construction of these items, complete in place, including, but not limited to, embankment and excavation, maintenance requirements, repair and replacement of damaged sections, removal of sediment deposits, redressing of aggregates and stones, cleaning of streets, and removal of erosion and sediment control systems at the end of construction.

1.4 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 conform to the following gradation requirements.

Sieve Size (Square Mesh)	Percent Retained (By Weight)
2-1/2”	0
2”	0 - 20
1-1/2”	15 - 50
¾”	60 - 80
No. 4	95 - 100

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 exits. Unless otherwise directed, maintain the stabilized construction roads and exits until the project is accepted by the Owner. Remove stabilized construction roads and exits 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 exit 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 exit, 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 City Engineer. 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 01 55 13.10

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. Unit Price Contracts.

1. Traffic control and regulation. Payment for traffic control and regulation is on a lump sum basis. Include preparation and submittal of traffic control plan if different than shown on Drawings, and provision of traffic control devices, equipment, and personnel necessary to protect the Work and public. Payment will be based on Contractor's Schedule of Values for traffic control and regulation.
2. Flagmen. Payment for flagmen is on a lump sum basis. Partial payments will be based on Contractor's Schedule of Values for flagmen.
3. New Portable Concrete Low Profile Traffic Barrier Provided. Payment is on a unit price basis for each linear foot of low profile traffic barrier provided, installed with hardware assemblies and connected together in accordance with the approved traffic control plan.
4. Portable Concrete Low Profile Traffic Barrier picked up from Stockpile. Payment is on a unit price basis for each linear foot of low profile traffic barrier picked up from designated stockpile, moved onto the project, set at location and connected together.
5. Portable Concrete Low Profile Traffic Barrier Installed. Payment is on a unit price basis for each linear foot of low profile traffic barrier delivered to the project location, installed with hardware assemblies and connected together in accordance with the approved traffic control plan.
6. Portable Concrete Low Profile Traffic Barrier Moved and Reset. Payment is on a unit price basis for each linear foot of low profile traffic barrier disassembled, moved on the project, reset at the new locations and connected together. Include cost to repair roadway in the unit price.
7. Portable Concrete Low Profile Traffic Barrier Removed. Payment is on a unit price basis for each linear foot of low profile traffic barrier removed from the project, including hardware assemblies, and stockpiling at location listed in Division 1. Include cost to repair roadway in the unit price.
8. Refer to Division 1 for unit price procedures.

B. Stipulated Price Contracts. Include payment for work under this section in the total Stipulated Price.

1.3 REFERENCES

A. Texas Manual on Uniform Traffic Control Devices (TMUTCD)

B. Article 4413 (29bb), commonly referred to as Private Investigators and Private Security Agencies Act, and Article 2.12, Texas Code of Criminal Procedure.

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. The plan must conform to TMUTCD requirements and be sealed by a Registered Texas Professional Engineer.

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 01 55 26

SECTION 01 5639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.10 SUMMARY:

This Section includes the measures for temporary tree and plant protection devices.

1.20 SUBMITTALS:

A. Samples and Product Data: Provide samples and product data for each item listed in 'Part-2 Products' of this Section.

B. Maintenance Recommendations: A licensed Arborist shall provide maintenance recommendations for affected trees before, during, and after the construction of the Work.

1.30 QUALITY ASSURANCE:

A. Experience: Contractor shall have successfully completed tree protection and trimming work similar to the Work of this Project. Contractor shall pay required fees for qualified Arborist with at least five (5) year experience with similar Work to oversee all operations.

B. Pre-Construction Meeting: Before tree protection operations begin, Contractor shall meet with representatives of authorities having jurisdiction, Owner, Architect, Landscape Architect, Arborist, consultants, and other concerned entities to review tree protection and trimming procedures and responsibilities.

1.40 PROJECT CONDITIONS:

A. Existing Conditions: Examine areas to receive tree and plant protection devices. Contractor shall notify Owner's Representative and /or Landscape Architect if existing tree locations differ from the locations as per the Drawings. Contractor shall proceed with Work only after unsatisfactory conditions have been corrected.

B. Existing Utilities: Contractor shall be responsible for any damage to existing utilities and structures.

C. Coordination with Other Trades: Install tree and plant protection devices before the onset of site clearing or any other Work on the site.

D. Security: Contractor shall be responsible for equipment and materials during course of the Work.

PART 2 - PRODUCTS

2.10 MATERIALS:

A. Temporary Fencing: Temporary fencing shall be orange, contractor grade, plastic, mesh fencing sized as per the Drawings.

B. Metal Stakes: Metal stakes shall be metal 'T' bar stakes sized as per the Drawings.

C. Mulch: Mulch shall be organic, shredded hardwood mulch free from harmful materials and suitable as a top dressing of trees and shrubs. Mulch shall be dark brown in color.

PART 3 - EXECUTION

3.10 PROTECTION:

A. Temporary Fencing: Install temporary fencing as per the Drawings.

B. Mulch: Install a two (2) inch layer of mulch within the drip line of single specimen trees and along the edge of tree protection zones to protect exposed root systems. Do not place mulch within six (6) inches of tree trunks.

3.20 PROJECT CONDITIONS:

A. Tree protection areas shall be free of the following materials: construction operations, trash and debris, stock piling of excavated or other materials, vehicular parking or circulation, pedestrian traffic, and any disturbances from Contractor or other trades on the site during the course of the Work.

B. Prevent soil compaction over root systems.

C. Protect root systems from damage caused by spillage of harmful materials while mixing or storing construction materials.

D. Protect root systems from erosion and excessive watering caused by construction operations

3.30 REGRADING:

A. Where possible, maintain existing grades within the tree protection areas.

B. Excavation: Where finish grade is indicated below existing grade around trees, slope grade away from trees as per Arborist recommendations, unless otherwise indicated.

1. Carefully hand excavate areas within the drip line of existing trees and in tree protection areas to minimize damage to existing root systems.

2. Keep exposed roots moist and protected until managed by new construction.

3. Root Pruning: If required, cut only small roots that interfere with construction, do not cut main lateral roots, tap root, or remove more than one-third (1/3) of the existing root system per tree. Cut roots with sharp pruning instruments and do not break, tear, or chop root systems.

C. Grade Elevating: Where new finish grade is indicated above existing grade, fill with topsoil. Place topsoil in a single non-compacted layer and hand grade to required finish elevations as per Arborist recommendations.

3.40 TREE PRUNING:

A. Tree Pruning: Prune trees to remain that are affected by temporary and permanent construction and to compensate for root loss caused by damaging or cutting root system as per Arborist recommendations.

B. Cut branches with sharp pruning instruments; do not break, tear, or chop branches.

3.50 MAINTENANCE:

A. Temporary Fencing: Maintain and keep fencing taught during the course of the Work. Promptly repair or replace any damaged fencing.

B. Immediately repair trees damaged by construction. Attend to declining trees and plant material to ensure their survivability. Treat damaged trunks, limbs, and roots as per Arborist recommendations.

C. Owner's Representative and / or Landscape Architect reserve the right to designate any plant material that has been damaged or that is declining by the course of Work to be replaced by the Contractor at no additional cost to the Owner.

1. Replacement material shall be of same size, species, and character as original material.

2. Trees larger than six (6) inch caliper: Replacement material shall be six (6) inch caliper and have the same species and character as original material plus Contractor shall compensate the Owner appropriately.

3. Specimen Trees: Contractor shall compensate Owner for loss of any specimen tree.

3.60 CLEAN UP AND DISPOSAL OF WASTE MATERIALS:

A. Burning is not permitted.

B. Remove displaced trees, cut branches, and chips from the site and legally dispose off site.

C. Upon Substantial Completion of all Work, remove all tree protection devices only with approval from Owner's Representative and / or Landscape Architect.

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).

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 two 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 at least seven days prior to Commencement of Construction Activity.

3.4 CERTIFICATION REQUIREMENTS

A. Conduct inspections in accordance with TCEQ requirements. Ensure persons or firms responsible for maintenance and inspection of erosion and sediment control measures read, fill out, sign, and date the Erosion Control Contractor's Certification for Inspection and Maintenance. Use the EPA NPDES Construction Inspection Form

3.5 RETENTION OF RECORDS

A. Keep a copy of this document and the SWP3 in a readily accessible location at the construction site from Commencement of Construction Activity until submission of

the Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity under TPDES Construction General Permit (TXR 150000). Contractors with day-to-day operational control over SWP3 implementation shall have a copy of the SWP3 available at a central location, on-site, for the use of all operators and those identified as having responsibilities under the SWP3. Upon submission of the NOT, submit all required forms and a copy of the SWP3 with all revisions to the Owner's Representative.

3.6 REQUIRED NOTICES

A. Post the following notices from effective date of the SWP3 until date of final site stabilization as defined in the Construction General Permit:

1. Post the TPDES permit number for Large Construction Activity, or a signed TCEQ Construction Site Notice for Small Construction Activity. A signed copy of the Contractor's NOI must also be posted.

2. Post notices near the main entrance of the construction site in a prominent place for public viewing. Post name and telephone number of Contractor's local contact person, brief project description and location of the SWP3.
   a. If posting near a main entrance is not feasible due to safety concerns, coordinate posting of notice with the Owner's Representative to conform to requirements of the Construction General Permit.
   b. If Project is a linear construction project (e.g.: road, utilities, etc.), post notice in a publicly accessible location near active construction. Move notice as necessary.
3. Post a notice to equipment and vehicles operators, instructing them to stop, check, and clean tires of debris and mud before driving onto traffic lanes. Post at each stabilized construction exit area.
4. Post a notice of waste disposal procedures in a readily visible location on site.

3.7 ON-SITE WASTE MATERIAL STORAGE

A. On-site waste material storage shall be self-contained and shall satisfy appropriate local, state, and federal rules and regulations.

B. Prepare list of waste material to be stored on-site. Update list as necessary to include up-to-date information. Keep a copy of updated list with the SWP3.

C. Prepare description of controls to reduce pollutants generated from on-site storage. Include storage practices necessary to minimize exposure of materials to storm water, and spill prevention and response measures consistent with best management practices. Keep a copy of the description with the SWP3.

3.8 NOTICE OF TERMINATION

A. Submit a NOT to TCEQ and the Engineer within 30 days after:

1. Final stabilization has been achieved on all portions of the site that are the responsibility of the Contractor; or
2. Another operator has assumed control over all areas of the site that have not been stabilized; and
3. All silt fences and other temporary erosion controls have either been removed, scheduled to be removed as defined in the SWP3, or transferred to a new operator if the new operator has sought permit coverage.

END OF SECTION 01 57 10

SECTION 01 57 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. Measurement for control of ground water, if included in Bid Form, will be on either a lump sum basis or a linear foot basis for continuous installations of well points, eductor wells, or deep wells.

B. If not included in Bid Form, include the cost to control ground water in unit price for work requiring such controls.

C. No separate payment will be made for control of surface water. Include cost to control surface water in unit price for work requiring controls.

D. Follow Division 1 for unit price procedures.

E. 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 aboveground 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 1.06B.

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 01 57 19

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. UNIT PRICES

1. Payment for filter fabric fence is on a linear foot basis measured between limits of beginning and ending of stakes.
2. Payment for reinforced filter fabric fence is on a linear foot basis measured between limits of beginning and ending of stakes.
3. Payment for drop inlet baskets is on a unit price basis for each drop inlet basket.
4. Payment for storm inlet sediment traps is on a unit price basis for each storm inlet sediment trap.
5. Payment for storm-water-pollution-prevention structures is on a lump sum basis for the project. Earthen structures with outlet and piping includes diversion dikes, interceptor dikes, diversion swales, interceptor swales, and excavated earth-outlet sediment trap, embankment earth-outlet sediment trap, down spout extenders, pipe slope drains, paved flumes, stone outlet sediment trap, and level spreaders.
6. Payment for straw bale barrier, if included in Bid Form, is on a linear foot of accepted bale barriers, if not include in cost of storm-water-pollution-prevention structures.

7. Payment for brush berm, if included in Bid Form, is on a linear foot of accepted brush berm, if not include in cost of storm water-pollution-prevention structures.
8. Payment for sandbag barrier, if included in Bid Form, is on a linear foot basis measured between limits of beginning and ending of sandbags, if not include in cost of storm-water-pollution prevention structures.
9. Payment for sediment basin with pipe outlet or stone outlet, if included in Bid Form, is on a square yard basis, if not include in cost of storm-water-pollution-prevention structures.
10. Payment for inlet protection barriers, if included in Bid Form, is on a linear foot basis measured along outside face of inlet protection barrier, if not include in cost of storm-water-pollution prevention structures.
11. Refer to Division 1 for unit price procedures.

B. 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. Straw Bale Fence: Install to allow surface runoff percolation through straw in sheet-flow manner and to retain and accumulate sediment. Maintain Straw Bale Fence to remain in proper position and configuration at all times.

C. Interceptor Dikes and Swales: Construct to direct surface or channel runoff around the project area or runoff from project area into sediment traps.

D. 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.

E. 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 3 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 8 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.

2.8 STRAW BALE

A. Straw: Standard-baled agricultural hay bound by wire, nylon, or polypropylene rope. Do not use jute or cotton binding.

B. Straw Bale Stakes (applicable where bales are on soil): No. 3 (3/8 diameter) reinforcing bars, deformed or smooth at Contractor's option, length as required for minimum 18 inch bury and full height bales.

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. . Redress 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 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 3 feet on center maximum and firmly embed minimum 8 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 STRAW BALE FENCE CONSTRUCTION METHODS

A. Place bales in row with ends tightly abutting adjacent bales. Place bales with bindings parallel to ground surface.

B. Embed bale in soil a minimum of 4 inches.

C. Securely anchor bales in place with Straw Bale Stakes driven through bales a minimum of 18-inches into ground. Angle first stake in each bale toward previously laid bale to force bales together.

D. Fill gaps between bales with straw to prevent water from channeling between bales. Wedge carefully in order not to separate bales.

E. Replace with new straw bale fence every two months or as required by Owner's Representative.

3.12 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.

3.13 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 lieu of or in addition to stabilized construction exits, 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.

3.14 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.

3.15 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.

3.16 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.

3.17 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.

3.18 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 01 57 23

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. Unit Prices.

1. Payment for restoration of Project site disturbed by utility construction operations is on a linear foot basis. Measurement will be as provided for corresponding utility in each Specification section. No separate payment made for branch pipe, valves and, other associated work for utilities. Measurement for restoration with multiple utilities within the same right-of-way will be on a linear foot basis for only one utility.
2. No separate payment made for facility or roadway projects. Include cost in the surface improvements associated with the facility or roadway construction.
3. Payment includes required site restoration within the right-of-way or easement regardless of size or type of pipe, method of construction, paved or unpaved areas or thickness and width of pavement.
4. No separate payment made for site restoration for service connections under this Section. Include cost in appropriate utility section.
5. Refer to Division 1 for Unit Price procedures.

B. 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 SUBMITTALS

A. Conform to requirements of Division 1.

B. Schedule of testing, service connections, abandonment, backfill, and site restoration.

C. Sample of notices to residents outlining their responsibility for maintenance of site improvements adjacent to the Project that are not disturbed by construction operations.

1.5 SCHEDULING

A. Schedule testing, service connections, abandonment, backfill and site restoration immediately following completion of pipe laying work or paving within each block or line segment.

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.

C. Construction of Projects with no Phases listed in Division 1:

1. Complete site restoration prior to disturbing over 50% of total project linear feet or 2,000 linear feet, whichever is greater, of right-of-way or easement.
2. Limit work to a maximum of 50% of total project linear feet or 2,000 linear feet, whichever is greater, of right-of-way and easement. Commence work in additional right-of-way or easement after completion of site restoration.

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 Preparatory Work

A. Provide cleanup and restoration crews to work closely behind pipe laying and roadway construction crews, and where necessary, during testing, service restoration, abandonment, backfill and surface restoration.

B. Water Lines: Unless otherwise approved by Owner's Representative, comply with the following:

1. Once Owner's Representative approves work within a Phase, immediately begin preparatory work for disinfection effort.
2. No later than three days after completing disinfection preparatory work, initiate disinfection work.
3. Immediately after transfer of services, begin abandonment of old water lines and site restoration.

C. Wastewater Lines:

1. Once Owner's Representative approves work within a Line Segment, immediately begin preparatory work for testing effort.
2. No later than three days after completing preparatory work for testing, initiate testing work.
3. Immediately after transfer of service connections, begin abandonment of old wastewater lines, and site restoration.

D. Street Construction and Paving Projects

1. Once Owner's Representative approves work within a Line Segment or block, immediately begin preparatory work for testing effort.
2. No later than three days after completing preparatory work for testing, initiate testing work.
3. Immediately after testing begin site restoration.

E. Street Construction and Paving Projects

1. Once Owner's Representative approves work within a block, immediately begin preparatory work for sidewalk construction, sodding and hydromulching and tree planting.
2. No later than seven days after completing preparatory work, initiate construction.

3.2 CLEANING

A. Remove debris and trash to maintain a clean and orderly site in accordance with requirements of General Conditions and Division 1.

3.3 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.

3.4 MAINTENANCE

A. Maintain shrubs, plantings, sodded areas and seeded areas.

B. Replace shrubs, plantings and seeded or sodded areas that fail to become established.

C. Refer to Division 1 for maintenance requirements.

END OF SECTION 01 74 16

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 01 74 19

SECTION 01 7800

CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 THIS SECTION INCLUDES:

A. Submittal procedures

B. Project Record Documents

C. Operation and Maintenance Data.

D. Warranties and bonds

E. Closeout Documents

1.02 SUBMITTAL PROCEDURES

A. Within sixty (60) calendar days of substantial completion, contractor shall submit closeout submittals as required in accordance with this Section.

B. Review and Final Submission of Closeout Submittals:

1. Participate in review meetings as required.
2. Document shall be reviewed and verified by contractor prior to submission to the Architect.
3. Review submittal with Owner and Architect prior to final submittal for review and electronic archiving.
4. Contractor shall allow 14 days from date of submission for Preliminary Architectural Review.
5. Make changes required from the Preliminary Architectural Review and deliver the Final Project Record Documents to the Architect.
6. Contractor shall allow 21 days from date of submission Final Project Record Documents for document reproduction.
7. Architect will coordinate electronic archiving of the final closeout submittal with Owner's designated company.
8. Contractor will pay all associated cost in preparing close-out documents.

1.03 SUBMITTAL FORMAT

A. All Close-out documents shall be submitted in three-ring binders with detailed table of contents, index tabs corresponding to the table of contents.

B. Each binder shall include an insert cover with the following information:

1. Project Name and Project Number

2. Binder Title: Close-out Manual

3. Architect's name and contact information.

4. Contractor's name and contact information.

C. Table of Contents and corresponding section tabs.

D. Submit one (1) electronic copy for review by the Architect. Resubmit as necessary to obtain final acceptance of Close-out documents.

E. Upon approval of the electronic copy, deliver final copies to the Owner.

F. Number of final copies: One(1) electronic format and two (2) hard copy in binders.

1.04 SUBMITTAL REQUIREMENTS

A. Record Drawings/Project Manual:

1. Maintain a set of Contract Drawings, project manual and shop drawings in clean, undamaged condition.
2. Mark up variations in the Work as originally shown.
3. Mark the drawing most capable of showing field conditions.
4. Where shop drawings are used for mark-up, cross reference with Contract Drawings.
5. Mark with red erasable pencil and where feasible, use other colors to distinguish categories of work.
6. Mark up new information of importance not shown on Contract Drawings or shop drawings.
7. Record work covered by subsequent construction or requiring the removal of finish material should maintenance be necessary.
8. Note related Change Order number where applicable.
9. Organize Record Drawing sheets into manageable sets. Identify each set.
10. Maintain one copy of each Product Data Submittal.

B. Maintenance and Operating Manuals:

1. Organize maintenance and operating information into sets of manageable size. Manual divisions shall match organization and location of specification sections indicated in Project Manual.
2. Bind into heavy duty 3-ring binders, minimum 2” size, permanently identified and indexed with thumb tabs.
3. Include:

    a. Name of project, nature of information, Contractor/subcontractor and name and address of local parts supplier and service organization.
    b. Emergency instructions.
    c. Spare parts listing.
    d. Wiring diagrams.
    e. Recommend turn-around cycles.
    f. Inspection procedures.
    g. Applicable shop drawings.
    h. Applicable product data.

C. Warranties:

1. Contractor shall furnish his written warranty. Unless specifically indicated otherwise in individual sections, the period for warranties shall begin on the Date of Substantial Completion and shall continue for one year. Warranties shall state the Date of Substantial Completion and the date on which the warranty expires.

2. In addition to the General Contractor’s, other required guarantees and warranties in excess of one-year shall be included in the Close-Out Binder in original form. All extended warranties shall begin on the Substantial Completion date.

D. Closeout Documents:

1. Copy of executed Certificate of Substantial Completion.

2. Copy of Building Permits.
3. Copy of Certificates of Occupancies.
4. Final List of Subcontractor (AIA G-805)
3. Consent of Surety to Final Payment (AIA G-707).
4. Contractor's Affidavit of Payment of Debts and claims (AIA G-706)
5. Contractor's Affidavit of Release of Liens (AIA G-706A) from each subcontractor and major suppliers.
6. Contractor's written one (1) year warranty/guarantees.
7. Sub-contractors written warranty/guarantees required in excess of one (1) year.
8. Manufacturer's warranty for the product/systems required in specification sections.
9. Certificate of No Asbestos, PCB and lead from each and every subcontractor and supplier.
10. Material Safety Data Sheets.
11. Owner's demonstration/training verification.
12. Extra stock verifications.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 THIS SECTION INCLUDES:

A. Demonstration of products and systems to be commissioned and requiring routine maintenance where indicated in specific specification sections.

B. Training of Galena Park ISD personnel in operation and maintenance is required for:

1. All software-operated systems.
2. HVAC systems and equipment
3. Plumbing equipment
4. Electrical systems and equipment.
5. Audio and Visual systems.
6. Lighting systems.
7. Security systems and Access Controls.
8. Fire Alarm system.
9. Fire Suppression system.
10. Items specified in individual product sections.

C. Training of Galena Park ISD personnel in care, cleaning, maintenance and repair is required for:

1. Roof, waterproofing and other weather-exposed or moisture protection products.
2. Finishes, including flooring, wall and ceiling finishes.
3. Fixtures and fittings
4. Items specified in individual product Sections.

1.02 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where s single person is not familiar with all aspects, provide specialists with necessary qualifications.

1.03 SUBMITTALS

A. Submit a draft training plan to Architect and Galena Park ISD in preparation of overall training plan'.

1. The Contractor shall provide a weather-tight field office building with lighting, electrical
2. Submit in editable electronic format, latest version of Microsoft Word required.
3. Galena Park ISD will designate personnel to be trained; tailor training to needs and skill-level of attendees.

B. Draft Training Plans:

1. Submit not less than four weeks prior to start of training.
2. Revise and resubmit until acceptable.
3. Provide an overall schedule showing all training sessions.

4. Include at least the flowing for each training sessions:

    a. Identification, date, time and duration.
    b. Description of products and/or systems to be covered..
    c. Name of firm and person conducting training, include qualifications.
    d. Intended audience, such as job description
    e. Objectives of training and suggested methods of ensuring adequate training.
    f. Methods to be used, such as classroom lecture, live demonstrations, hands-on etc.
    g. Media to be used, such as a slides, hand-outs etc.
    h. Training equipment required, such as projector, projection screen, etc. to be provided by Contractor.

C. Training Manuals:

1. Provide training manual for each attendee, allow for minimum of two attendees per training session.
2. Include applicable portion of O&M manuals.
3. Include copies of all hand-outs, slides. Overheads, video presentations etc. that are not included in O&M manuals.
4. Provide on extra copy of each training manuals to be included with operation and maintenance data.

D. Training Reports

1. Identification of each training sessions, date, time and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answer to questions that could not be answered in original training sessions.
4. Include Galena Park ISD's formal acceptance of training session.

E. Video Recordings:

1. Submit digital video recording of each demonstration and training session for Galena Park ISD's subsequent use.
2. Format: DVD Disc.
3. Label each disc and container with session identification and date.
4. Provide sign-off sheets in the closeout documents indication the individuals who were in attendance at each of the training sessions.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION (NOT USED)

END OF SECTION

SECTION 02 22 20
ABANDONMENT OF SEWERS

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Abandonment in place of existing sewers, junction structures, manholes, and force mains.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for grout fill and abandonment of existing sewers, including boxes and elliptical shaped sewers, is on linear foot basis for each diameter of sewer being abandoned. Measurement will be along centerline of sewer from centerline to centerline of manholes.

2. Payment for grout fill and abandonment of sewer manholes or junction structure is by each manhole or junction structure abandoned in conformance with this Section.

3. Payment will be full compensation for all material, equipment, and labor required for complete abandonment grouting, including air venting, testing, temporary plugs, fill lines, excavations, and incidentals.

4. No separate payment will be made for plugging and abandoning sewer force mains. Include cost of such abandonment in related work.

5. Refer to Section 01270 - Measurement and Payment for unit price procedures.

6. Acceptability of grout material is based on achieving average strength within range of 75 to 150 psi as defined in Paragraph 2.01B.1. Grout that is out of range after placement may be accepted with price adjustment of 1.0 percent price deduction for each psi average compressive strength below 75 psi and 0.5 percent price deduction for each psi average compressive strength above 150 psi, as applicable to material volume represented by test series. Shrinkage in grout material placements shall be remedied by Contractor according to Paragraph 3.04H without additional compensation.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

1.03 DEFINITIONS

A. Abandonment. Sewer abandonment consists of demolition and removal of portion of manholes existing within specified depth of surface, and abandonment in place of sewer lines and manholes as specified in this Section.

B. Flowable Fill. Flowable fill (abandonment grout) shall be controlled low-strength material consisting of fluid mixture of cement, fly ash, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in sewer pipes or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access. Long-term hardened strength shall be within specified range.

C. Ballast. Large aggregate either replaced with voids subsequently filled with flowable fill injected by grouting method; or in areas with open access, placed individually and sequentially at same time as flowable fill placement.

D. Backgrouting. Secondary stage pressure grouting to ensure that voids have been filled within abandoned sewer. Backgrouting will only be required at critical locations indicated on Drawings or if there is evidence of incomplete flowable fill placements.

1.04 REFERENCE STANDARDS

A. ASTM C 150 - Standard Specification for Portland Cement.

B. ASTM C 494 - Standard Specification for Chemical Admixture for Concrete.

C. ASTM C 618 - Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.

D. ASTM C 937 - Standard Specification for Grout Fluidifier for Pre-placed Aggregate Concrete.

E. ASTM C 940 - Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Replaced Aggregate Concrete in the Laboratory.

F. ASTM C 1017 - Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.

G. ASTM C 1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

1.05 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Flowable fill mix design report:

1. Flowable fill type and production method. Describe if fill will be mixed to final proportions and consistency in batch plant or if constituents will be added in transit mixer at placement location.

2. Use of ballast. Provide percentage of ballast of total placement and size limits for ballast if fill is intended to be used with ballast.

3. Aggregate gradation of fill. Aggregate gradation of mix (excluding ballast) shall be used as pilot curve for quality control during production.

4. Fill mix constituents and proportions including materials by weight and volume, and air content but excluding ballast. Give types and amounts of admixtures including air entrainment or air generating compounds.

5. Fill densities and viscosities, including wet density at point of placement.

6. Initial time of set.

7. Bleeding and shrinkage.

8. Compressive strength.

C. Technical information for equipment and operational procedures including projected slurry injection rate, grout pressure, method of controlling grout pressure, bulkhead and vent design, and number of stages of grout application.

D. Experience record for proposed crew, showing minimum of 100 cubic yards of flowable fill placed using proposed or similar equipment and methods.

E. At least 60 days prior to commencing abandonment activities, submit plan for abandonment, describing proposed grouting sequence, bypass pumping requirements and plugging, if any, and other information pertinent to completion of work.

PART 2 P R O D U C T S

2.01 FLOWABLE FILL

A. Design Mix Criteria. Provide design of one or more mixes to meet design criteria and conditions for placement. Present information required by Paragraph 1.05B in mix design report including following:

1. Cement: ASTM C 150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 100 pounds per cubic yard.

2. Fly ash: ASTM C 618 Class C or F. Volume and weight per cubic yard of fill. Provide minimum Fly ash content of 200 pounds per cubic yard.

3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.

4. Aggregate gradation: 100 percent passing 3/8-inch sieve and not more than 10 percent passing No. 200 sieve. Mix design report shall define pilot gradation based on following sieve sizes 3/8-inch, Nos. 4, 8, 16, 30, 50, 100, and 200. Do not deviate from pilot gradation by more than plus or minus 10 percentage points for any sieve for production material.

5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, add at least 30 percent of natural aggregate to provide workability.

6. Admixtures: Use admixtures meeting ASTM C 494 and ASTM C 1017 as needed to improve pumpability, to control time of set, and reduce bleeding.

7. Fluidifier: Use fluidifier meeting ASTM C 937 as necessary to hold solid constituents in suspension. Add shrinkage compensator if necessary.

8. Performance additive: Use flowable fill performance additive, such as Darafill or approved equal, to control fill properties.

B. Flowable Fill Requirements

1. Unconfined compressive strength: minimum 75 psi and maximum 150 psi at 56 days as determined based on an average of three tests for same placement. Present at least three acceptable strength tests for proposed mix design in mix design report.

2. Placement characteristics: self-leveling.

3. Shrinkage characteristics: non-shrink.

4. Water bleeding for fill to be placed by grouting method in sewers: not to exceed 2 percent according to ASTM C 940.

5. Minimum wet density: 90 pounds per cubic foot.

2.02 BALLAST

A. Ballast Material: Natural rock or concrete pieces with minimum size equal to at least 10 times maximum aggregate size of flowable fill and maximum size of 24 inches. Maximum dimension shall not be more than 20 percent of minimum dimension of

space to be filled.

B. Ballast Composition: Free of regulated waste material.

2.03 PLUGS FOR FORCE MAINS

A. Grout Plugs: Cement-based dry-pack grout conforming to ASTM C 1107, Grade B or C.

B. Manufactured Plug: Commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned.

PART 3 E X E C U T I O N

3.01 PREPARATION

A. Have fill mix design reports and other submittals required by Paragraph 1.05 accepted by Project Manager prior to start of placement. Notify Project Manager at least 24 hours in advance of grouting with flowable fill.

B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at pressure that will not distort or imperil portion of work, new or existing.

C. Clean sewer lines and video with closed circuit television to identify connections, locate obstructions, and assess condition of pipe. Locate previously unidentified connections, which have not been redirected and reconnected as part of this project, and report them to Project Manager. During placement of fill, compensate for irregularities in sewer pipe, such as obstructions, open joints, or broken pipe to ensure no voids remain unfilled.

D. Perform demolition work prior to starting fill placement. Clean placement areas of sewers and manholes of debris that may hinder fill placement. Remove excessive amounts of sludge and other substances that may degrade performance of fill. Do not leave sludge or other debris in place if filling more than 2 percent of placement volume. Dispose of waste material in compliance with Section 01576 - Waste Material Disposal.

E. Remove free water prior to starting fill placement.

3.02 EQUIPMENT

A. Mix flowable fill in automated batch plant and deliver it to site in ready-mix trucks. Performance additives may be added at placement site if required by mix design.

B. Use concrete or grout pumps capable of continuous delivery at planned placement rate.

3.03 DEMOLITION OF SEWER MANHOLES, PIPELINE STRUCTURES, AND FORCE MAINS PRIOR TO ABANDONMENT

A. Remove manhole frames and covers and castings from other existing pipeline structures. Deliver castings to nearest City of Houston maintenance facility for future use. Alternatively, salvaged castings may be used upon approval by Project Manager, for constructing new manholes on this project.

B. Demolish and remove precast concrete adjustment rings and corner section, or brick and mortar corbel and chimney, or other pipeline structure, to minimum depth of 4 feet below finished grade. Structure may be removed to greater depth, but not deeper than 18 inches above crown of abandoned sewer.

C. When adjacent sewer lines are not to be filled, place temporary plugs in each line connecting to manhole, in preparation for filling manhole.

D. Excavate overburden from force mains to be abandoned at locations indicated on Drawings, conforming to Section 02317 - Excavation and Backfill for Utilities. Cut existing force main, when necessary, to provide an end surface perpendicular to axis of pipe and suitable for plug to be installed. Remove force main piping material remaining outside of segment to be abandoned.

3.04 INSTALLATION

A. Abandon sewer lines by completely filling sewer line with flowable fill. Abandon manholes and other structures by filling with flowable fill, together with ballast as applicable, within depth of structures left in place.

B. Place flowable fill to fill volume between manholes. Continuously place flowable fill from manhole to manhole with no intermediate pour points, but not exceeding 500 feet in length.

C. Have filling operation performed by experienced crews with equipment to monitor density of flowable fill and to control pressure.

D. Temporarily plug sewer lines which are to remain in operation during pouring/pumping to keep lines free of flowable fill.

E. Pump flowable fill through bulkheads constructed for placement of two 2-inch PVC pipes or use other suitable construction methods to contain flowable fill in lines to be abandoned. These pipes will act as injection points or vents for placement of flowable fill.

F. Place flowable fill under pressure flow conditions into properly vented open system until flowable fill emerges from vent pipes. Pump flowable fill with sufficient pressure to overcome friction and to fill sewer from downstream end, to discharge at upstream end.

G. Inject flowable fill through replaced ballast using grouting equipment and series of grout pipes discharging at bottom of placement, allowing fill to rise through ballast effectively filling all voids. Alternatively, sequentially place individual pieces of ballast at same time as flowable fill is placed. Do not fill with ballast more than 50 percent of volume at any level, to prevent nesting and void formation.

H. Remediate placement of flowable fill which does not fill voids in sewer, in manhole or other structures, or where voids develop due to excessive shrinkage or bleeding of fill, by using pressure grouting either from inside sewer or from surface. Pressure grout shall conform to Section 02431 - Tunnel Grout.

I. Plug each end of force main being abandoned.

J. Force main abandonment

1. Clean inside surface of force main at least 12 inches from ends to achieve firm bond and seal grout plug or manufactured plug to pipe surface. Similarly, clean and prepare exterior pipe surface if manufactured cap is to be used.

2. When using grout plug, place temporary plug or bulkhead approximately 12 inches inside pipe. Fill pipe end completely with dry-pack grout mixture.

3. When using manufactured plug or cap, install fitting as recommended by manufacturer's instructions, to form water tight seal.

K. Backfill to surface, above pipe or structures left in place, with flowable fill in restricted areas, compacted bank run sand in unrestricted areas to be paved or select fill in unrestricted areas outside of pavement. Place and compact backfill, other than flowable fill, in compliance with Section 02317 - Excavation and Backfill for Utilities.

L. Collect and dispose of excess flowable fill material and other debris in accordance with Section 01576 - Waste Material Disposal.

3.05 FIELD QUALITY CONTROL

A. Provide batch plant tickets for each truck delivery of flowable fill. Note on tickets addition of admixtures at site.

B. Check flow characteristics and workability of fill as placement proceeds.

C. Obtain at least three test cylinders for each placement area for determination of 56-day compressive strength and bleeding. Acceptance of placement will be based on average strength of three tests.

D. Record volume of ballast together with flowable fill placement for same space to demonstrate that voids have been filled.

3.06 PROTECTION OF PERSONS AND PROPERTY

A. Provide safe working conditions for employees throughout demolition and removal operations. Observe safety requirements for work below grade.

B. Maintain safe access to adjacent property and buildings. Do not obstruct roadways, sidewalks or passageways adjacent to work.

END OF SECTION

SECTION 02 4116

STRUCTURAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition and removal of buildings and site improvements.
B. Abandoning in-place or removing below-grade construction as shown.
C. Disconnecting, capping or sealing and abandoning in-place or removing site utilities as shown.
D. Obtain City of Houston Demolition Permit.

1.2 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA approved certificate program.

1.3 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
   01 Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
   02 Maintain access to existing walkways, exits and other facilities used by occupants of adjacent buildings.
   03 Do not close or obstruct walkways, exits or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Hazardous Materials: Materials suspected of containing hazardous materials should have been removed by the General Contractor prior to demolition.

D. Storage or sale of removed items or materials on-site will not be permitted.

E. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

F. Owner reserves the right to salvage any usable items.

1.4 MATERIAL OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   01 Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PRE-INSTALLATION MEETING

A. Conduct conference at Project Site.
   01 Inspect and discuss condition of construction to be demolished.
   02 Review structural load limitations of existing structures.
   03 Review and finalize building demolition schedule and verify availability of demolition personnel, equipment and facilities needed to make progress and avoid delays.
   04 Review and finalize the protection requirements.
   05 Review procedures for noise control and dust control.
   06 Review procedures for protection of adjacent buildings.
   07 Review items to be salvages and return to Owner.

1.6 SUBMITTALS

A. Proposed protection measures: Submit reports, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Building Demolition Activities: Indicates the following:
   01 Detail sequence of demolition work, with starting and ending dates for each activity.
   02 Temporary interruption of utility services.
   03 Shut off and capping of utility services.

C. Statement of Refrigerant Recovery: Signed by Refrigerant Recovery Technician responsible for Recovery refrigerant, stating that all refrigerant that was present was recovered and that recovery is performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

PART 2- PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review record drawings, existing conditions and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as indicated in Project Record Documents.

C. Perform an engineering survey of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Salvage Items: Comply with the following:

   01 Clean salvaged items of dirt and demolition debris.
   02 Pack of crate items after cleaning. Identify contents of containers.
   03 Store items in a secure area until delivery to Owner.
   04 Transport items to storage area designated by Owner.
   05 Protect items from damage during transport and storage.

3.3 UTILITY SERVICES

A. Existing utilities to be Disconnected: Locate, identify, disconnect and seal or cap off utilities serving buildings and structures to be demolished.

01. Owner will arrange to shut off utilities when requested by Contractor.
02. Arrange to shut off utilities with utility companies.
03. If removal, relocation or abandoned of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to the demolished and that maintain continuity of service to other buildings and structure.
04. Cut off pipe or conduit a minimum of 30 inches below grade. Cap, valve or plug and seal remaining portion of pipe or conduit after bypassing according to requirements authorities having jurisdiction.
05. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries and other building facilities during demolition operations. Maintain exists from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

01 Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
02 Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
03 Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolition and remove existing buildings and site improvements completely as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

01. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
02. Maintain adequate ventilation when using cutting torches.
03. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways and other adjacent occupied and used facilities.

01. Do not close or obstruct streets, walks, walkways or other adjacent occupies or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
02. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding and pollution.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolitions of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist or other device that will convey debris to grade level in a controlled descent.

01. Remove structural framing members and lower to ground by method suitable for minimum ground impact and dust generation.

C. Completely remove all building structure, building slabs and all utilities that occur within 5 feet beneath grade. Capp all utility lines.

D. Remove walks and drives as shown on the drawings. Protect existing street curbs shown to remain.

E. Disconnect any electric, telephone, gas, water, steam or other injection lines servicing the structure, per rules and regulations of authorities having jurisdiction or as directed by the Architect.

F. Hydraulic Elevator System: Demolish and remove elevator system, including cylindrical plunger, well assembly, steel well casing and liner, oil supply lines and tanks.

3.7 SITE PREPARATION

A. Below-Grade Areas: completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirement in Division 31 sections.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between existing adjacent grades and new grades. Slope fill to natural drainage patterns so that ponding does not occur. Bring fill elevations up to surrounding existing grade elevations.

3.8 REPAIRS

A. Properly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERILAS

A. General: Promptly dispose of demolished materials from project site and recycle or dispose of those in according to Division 1 Section “Construction Waste Management and Disposal”.

01 Do not allow demolished materials to accumulate on site.
02 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.10 CLEANING

A. Grub out all stumps, roots and other debris, more than 1 ½” in diameter.

B. Clean adjacent structures and improvements of dust, dirt and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

01 Clean roadways of debris caused by debris transport.

END OF SECTION

SECTION 02 5000

SITE DEMOLITION

PART 1 – GENERAL

1.1 WORK INCLUDES:

A. The extent of Work of this Section is to be determined by site inspection in addition to information given in the Contract Documents.

B. Remove any existing playground equipment, pavement, walks, fence, trees, bushes and debris from site.

1.2 OWNERSHIP OF REMOVED MATERIALS

A. Material designated for removal shall become the property of the Contractor, and any salvage value therefrom will accrue to the Contractor.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXECUTION

A. Remove from site and make legal disposition of all debris. No debris shall be buried on site as a means of disposal.

B. Remove from site and dispose of salvageable items, unless designated for re-use or to be salvaged by owner.

C. Preserve and protect trees, bushes, fences, etc., and non paved areas on site.

D. Remove all vegetation, trees, stumps, and debris that interferes with the new work under the contract, and dispose of all material off-site.

E. Backfill depressions and excavations caused by this Work to level of existing grade unless otherwise required by drawings.

F. Cut drainage swales and provide temporary grading in immediate area of new work to protect foundation work and to carry storm water away during construction. No water will be permitted to stand around foundation or excavations.

G. Furnish all labor and materials necessary for the demolition of existing work.

END OF SECTION 02 5000

SECTION 03 3300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 THIS SECTION INCLUDES:

A. Perform all work necessary and required for the construction of the project as indicated. Such work includes, but is not necessarily limited to the furnishing and installing of all concrete and cement work, vapor retarder, reinforcing steel, formwork, inserts, finishing and related items necessary to complete the work indicated on the drawings and described in the specifications. Without restricting the generality of the foregoing, the following items of work are included:

1. Foundation Work:
   a. Foundation for columns and walls.
   b. Furnishing and setting of anchors, inserts, and other related items as may be reasonable inferred to make the work under this Section complete.

2. Superstructure Work:
   a. Walls, columns, slab, and curbs.
   b. Stairs and steps where noted to be of concrete or to have concrete topping or fill.
   c. Installation and grouting in of metal anchors, anchor slots, reglets, hangers, supports, ties, inserts, bolts, corner guards, and sleeves built into concrete work.
   d. Concrete pads, foundations and pits as may be required under mechanical and electrical equipment.
   e. Concrete walks.
   f. Premoulded expansion joints.
   g. Concrete slabs on grade.
   h. Temporary bracing as may be required for the safe execution of the work specified herein.

B. Examine carefully the drawings for Plumbing, Mechanical and Electrical Work. These subcontractors will furnish and set sleeves or box forms required for openings. Contractor shall use care in placing reinforcement and pouring concrete so as not to displace such sleeves and boxes.

1. All slots, chases, recesses, or openings indicated on the drawings, which are not formed, by sleeves or boxes shall be provided in locations shown. When the work of other Contractors is completed, the excess part of the openings shall be completely closed with concrete.

2. Cooperate with others in providing for the installation of inserts, hangers, and other fastening devices required for the attachment of their work.

1.02 PREINSTALLTION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1. In addition to reviewing the formwork, reinforcement, concrete materials, mixture design, placement procedures, methods for achieving specified floor and slab flatness and levelness, and finishes for cast-in-place concrete, review the following concrete indicated to receive polished

finish:
a. Curing materials and procedures.
b. Floor and Slab flatness and levelness measurement.
c. Protection of slabs to receive polished finish.

2. Require attendance by
a. Contractor's superintendent
b. Concrete Subcontractor
c. Concrete Polishing Subcontractor

1.03 CODES AND STANDARDS

A. Except as modified by the requirements specified herein and/or the details on the drawings, all work included in this section shall conform to the applicable provisions of the following codes and standards.

1. American Concrete Institute (ACI);
a. "Building Code Requirements for Reinforced Concrete," ACI 318.
b. "Specifications for Structural Concrete Buildings," ACI 301.
c. "Recommended Practice for Evaluation of Strength Test Results of Concrete," ACI 214.
d. "Cold Weather Concreting," ACI 306.
e. "Hot Weather Concreting," ACI 305.
f. "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," ACI 304.
g. "Recommended Practice for Concrete Formwork", ACI 347.
h. "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315.

2. American Society for Testing Materials (ASTM): The specifications and standards hereinafter referred to, latest edition.

3. Concrete Reinforcing Steel Institute (CRSI):
a. "Reinforced Concrete - A Manual of Standard Practice".
b. "Recommended Practice for Placing Reinforcing Bars".
c. "Recommended Practice for Placing Bar Supports".

4. Local Ordinances.

5. Keep one copy of ACI's "Manual of Concrete Practice" at job site at all times.

1.04 SUBMITTALS

A. Submit concrete mix design and appropriate field-test data for each strength and type of concrete proposed.

B. Submit product data for expansion joint fillers, concrete admixtures, and membrane curing compounds.

C. Fully detailed shop drawings, including bending schedules and bending diagrams, shall be submitted to the Engineer for approval. Shop drawings shall show placing details and size and location of all reinforcing steel.

D. Shop drawings shall be of such detail and completeness that all fabrication and placement at the site can be accomplished with the use of the shop drawings. Shop drawings shall include number of pieces, sizes, and marking of reinforcing steel, accessories, and any other information required for fabrication and placement.

E. Complete shop and placing drawings for all reinforced concrete work shall be drawn to a scale of 1/8" = 1'-0" or larger. Detail wall reinforcement on 1/4" = 1'-0" scale elevations. If so detailed on structural plans, detail the top and bottom reinforcement on separate plans, each showing all bars, details, accessories, etc., required for proper fabrication and placement of that portion of the reinforcement.

F. Contractor shall check architectural, structural, mechanical, and electrical project or contract drawings for anchor bolt schedules and location, anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete, and shall make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

G. Reinforcing steel shall not be fabricated or placed before the shop drawings have been approved by the Engineer and returned to the Contractor. Approval of shop drawings by the Engineer will not relieve the Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.

H. Two copies of mill affidavits, stating the grades and physical and chemical properties of the reinforcing steel, shall be submitted to the Engineer before delivery of the steel to the job site.

I. For exposed concrete submit fabricating drawings of forms showing the jointing of facing panels, the location of form ties, and any necessary alignment bracing.

1.05 STORAGE OF MATERIALS

A. Store bagged cement on platforms off ground; protect stored cement against the elements. Handle and store fine and coarse aggregates separately in manner to prevent intrusion of foreign material or segregation of the material. Protect all reinforcement until used. Do not use any hardened cement.

B. Schedule reinforcement deliveries to minimize on site storage. Where such storage is unavoidable, place the reinforcement on blocks and cover.

C. Mild steel reinforcement at the time of placement of concrete shall be clean and free of all loose dirt, form oil, and other coatings affecting bond.

1.06 PRODUCT HANDLING

A. Steel reinforcement shall be transported to the building site, stored, and covered in a manner, which will insure that, no moisture, dirt, grease, or any other cause that might impair bonding to concrete. A sufficient supply of approved reinforcing steel shall be stored on the building site at all times to ensure that there will be no delay of the work. Identification of steel shall be maintained after bundles are broken.

1.07 FIELD SAMPLE PANEL

A. Prior to placing concrete for broom finished slabs, Contractor shall place three 3'-0" x 3'-0" x 4" thick sample slabs showing range of broomfinish proposed, for approval by the Engineer/Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150 Type I, except where noted.

B. Sand: Clean hard natural sand, or manufactured sand, or a combination of both and conforming to ASTM C33.

C. Coarse Aggregate: Shall be hard, durable, uncoated crushed stone, or gravel conforming to ASTM C33.

1. Maximum size aggregate allowed is 1/5 narrowest dimension between forms of the concrete member or 3/4 of minimum clear spacing between reinforcing bars, or as recommended in ACI Standard No. 613.

3. For concrete having an exterior surface exposed, 95 to 100% shall pass a 1-1/2 inch sieve; 35 to 70% shall pass a 3/4-inch sieve; 10 to 30% shall pass a 3/8-inch sieve and not over 5% shall pass a No. 4 sieve. Percentages are by weight.

D. Mixing Water: Shall be portable.

E. Expansion Joint Fillers: Self-expanding corkboard conforming to ASTM D1752 for exterior work. Joint fillers shall extend full depth of slab or joint and be of thickness and lengths indicated on drawings.

F. Air-Entraining Admixture: ASTM C260.

G. Water Reducing Admixture: ASTM C494, Type A. No admixture containing chlorides as a functional ingredient will be permitted.

H. Accelerating Admixtures: ASTM C494, Type C. No admixture containing chlorides as a functional ingredient will be permitted.

I. Superplasticizers: ASTM C494, Type F.

J. Calcium chloride will not be permitted.

K. Vapor retarder shall have all of the following qualities:
1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Other performance criteria:
   a. Strength: ASTM E1745 Class A.
   b. Thickness: 15 mils minimum
3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.

L. Vapor retarder products:

1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.
2. Approved Alternate: Vaporguard by Reef Industries, 713-507-4250. www.reefindustries.com.
3. Approved Alternate: PMPC by WR Meadows, 800-342-5976. http://www.wrmeadows.com/pmpc/
4. No substitutions.

M. Membrane Curing Compound (optional): ASTM C309, Type 1D (white) and shall be compatible with traffic deck sealer specified in Section 07950.

1. VOCOMP-20 by W.R. Meadows

N. Absorptive Cover (optional): Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yard and complying with AASHTO M182, Class 3.

O. Moisture-Retaining Cover: One of the following, complying with ASTM C171.

1. Waterproof paper.

2. Polyethylene film, 8-mil thickness.

3. White burlap-polyethylene sheet.

P. Reinforcing bars shall be new, deformed billet steel bars, conforming to ASTM A615, Grade 60 (#3 bars may conform to ASTM A615, Grade 40).

Q. Welded wire fabric shall be new, rectangular welded steel wire fabric, conforming to ASTM A185.

R. Anchoring hardware shall conform to the requirements set forth in the ACI 318 "Standard Building Code for Reinforced Concrete".

S. Reinforcing steel shall be bundled and tagged with grades and suitable identification marks for checking, sorting, and placing. Tags and markings shall be waterproof and shall not be removed until steel is placed.

T. Reinforcement accessories, consisting of spacers, chairs, ties, and similar items shall be provided as required for spacing, assembling and supporting reinforcement in place. All accessories shall be of plastic tipped galvanized steel, stainless steel or approved plastic conforming to the applicable requirements of the CRSI Standards hereinbefore specified.

U. Tie wire for reinforcement shall be 16 gage or heavier, where noted or specified, black or galvanized steel wire conforming to ASTM A82.

V. Forms for exposed concrete at exterior of building: Unless otherwise shown or specified, construct all formwork for exposed concrete surfaces (this includes all surfaces to receive a painted finished coat) with plywood, metal-framed plywood-faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

W. Forms for exposed concrete at interior of building: Form concrete surfaces with plywood, lumber,

metal of other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit. Use either 6" or 8" wide lumber, nominal 1" thickness, or plywood as specified for exterior exposed concrete, at Contractor's option. Use "BB FIR" or "MDO" grade plywood for underside of parking decks.

X. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within one inch (1") of concrete face. Inner tie rod shall be left in concrete when forms are removed. No wire ties or wood spreaders will be permitted.

Y. Form Anchors and Hangers: Anchors and hangers used for exposed concrete shall not leave exposed metal at surface. Hangers supporting forms form structural steel shall be symmetrically arranged on supporting members to minimize twisting or rotation of member. Penetration of structural steel members will not be permitted.

Z. Form Coatings: Form coating shall be a polymeric material and shall contain no wax or oil.

2.02 FABRICATION

A. Fabrication of steel reinforcement shall be in accordance with the details shown on the drawings and approved shop drawings. Where specific details are not shown or noted, comply with the applicable requirements of the "Codes and Standards" hereinbefore specified.

B. Bars shall be accurately bent, cut, and placed as indicated on the drawings. Bars shall be bent cold, heating of bars will not be permitted. Bars shall not be bent or straightened in any manner that will injure the material.

PART 3 EXECUTION

3.01 PROPORTIONING AND MIXING

A. Proportioning shall be in accordance with Chapter 3, ACI 301, Section 3.9.

B. Admixtures as specified hereinbefore may only be used with written permission from the Engineer. No admixtures containing any chloride ions, fluorides, or nitrates may be used.

C. The consistency of any mix shall be adjusted to allow for specific placing conditions. Where concrete must fill small, thin, complicated forms, the slump shall be greater than for large masses. Slumps shall be determined according to standard Specification ASTM C143. Slumps above the amounts listed in Chapter 3, ACI 301 shall in no case be permitted unless specific permission is obtained from the Engineer in writing.

D. Aggregates for concrete shall be measured by weighing. Each size of aggregate and the cement shall be weighed separately. Weighing devices shall be accurate within one percent. Cement in sacks of 94 pounds need not be weighed, but bulk cement and fractional packages must be weighed. Mixing water shall be measured by volume.

E. All concrete exposed to the exterior shall contain 4% +/-1% entrained air.

F. Use water reducing and retarding admixtures for hot weather placement. Proportion admixture in accordance with manufacturer's recommendation. No variation in the water-cement ratio established by the preliminary test will be permitted.

G. Do not add calcium chloride to the mixture.

H. Ready-mixed concrete, shall be used and shall conform to ASTM C94 in addition to the other requirements specified herein. Each load of concrete delivered to the job shall be accompanied by a delivery ticket, showing the following information:

1. Name of ready-mix batch plant.

2. Serial number of ticket.

3. Date and truck number.

4. Name of contractor.

5. Specific designation of job (name and location).

6. Specific class or designation of the concrete in conformance with specifications.

7. Amount of concrete (cubic yards).

8. Time loaded or of first mixing of cement and aggregate.

9. Water added by receiver of concrete and his initials.

10. Type and name of admixture and amount of same.
At the job site, each ticket shall be marked with the time of placement and where used in the project. Deliver all tickets to owner's representative.

I. Reinforcing steel shall be placed in accordance with the drawings and approved shop drawings and the applicable requirements of the "Code and Standards" hereinbefore specified. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete.

J. Bars shall be supported on chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. Additional bars shall be supplied whether specifically shown on the drawings or where necessary to securely fasten reinforcement in place. Support legs of accessories in forms without embedding in form surface. Spacing of chairs and accessories shall conform with CRSI's "Recommended Practice for Placing Bar Supports." Hooping and stirrups shall be accurately spaced and wired to the reinforcing. No wood or clay brick will be permitted inside forms. Masonry Blocks or Bricks are <u>not</u> allowed.

K. All reinforcing shall be set in place, spaced, and rigidly and securely tied or wired at all splices and at all crossing points and intersections in the position shown, or as directed. Rebending of bars and on the job to fix existing conditions will not be permitted without the written approval of the Engineer. Point ends on wire ties away from forms.

L. Minimum center to center distance between parallel bars shall be in accordance with the details on the drawings or, where not shown, the clear spacing shall be 1-1/2 times the bar diameter but in no case less than 1-1/2 inches nor less than 1-1/3 times the maximum size aggregate.

M. Laps of splices, where shown or noted on drawings, shall be adequate to transfer stress by bond. Unless shown otherwise on drawings, lap bars a minimum of 32 diameters but in no case less than 12 inches. Whenever possible, splices of adjacent bars shall be staggered.

N. Welded wire fabric shall be in as long lengths as practicable and shall be wired at all laps and splices. Laps shall be ten inches (10"). End laps shall be offset in adjacent widths.

O. Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, No. 3 minimum shall be added to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted.

P. Except where shown otherwise on the drawings, the minimum concrete coverage for steel reinforcement shall be as follows:

1. Where concrete is placed against earth ..... 3 inches
2. Over column ties ..... 1-1/2 inches
3. Formed walls ..... 1-1/2 inches for bars No. 5 and smaller, and 2 inches for bars over No. 5 in size.
4. Suspended slabs ..... 1 inch for #11 and smaller 1-1/2 inches for greater than #11.

Q. The design layout, construction and removal of formwork shall be the sole responsibility of the contractor.

R. Earth Forms: If conditions warrant, and the approval of the Engineer is secured, earth trench forms for footings will be allowed. Where footings are placed on dry soil or pervious material, waterproof paper shall be laid over the earth surfaces to receive concrete. Soil may be thoroughly wetted to optimum moisture content prior to placing concrete in lieu of using waterproof paper.

S. Formwork - General: Forms shall be constructed of sound material, shall be of the correct shape and dimensions, mortar tight, of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of line or position. Before reusing forms, or when using second-hand lumber for forms, same shall be cleaned and all nails removed therefrom. Forms shall be strong enough to maintain their exact shape under all imposed loads. Camber where necessary to assure level finished soffits. Forms shall be so constructed that they may be easily removed without damage to the concrete. Before concrete is placed in form, the horizontal and vertical position of the form shall be carefully verified and all inaccuracies corrected. All welding and bracing shall be completed in advance of placing of concrete.

T. Forms for Exterior Exposed Concrete (concrete to receive paint): Plywood panels shall be clean, smooth, uniform in size, and free from damaged edges and holes. Full size panels shall be used wherever possible. After construction, tape joints of plywood panels to prevent joint protrusions in concrete. Horizontal joints must be level and continuous. All edges of plywood must be backed to prevent separation. Use special care in the forming and stripping of the forms to protect the corners. Form inside corners with mitered boards so that no concrete is placed against form ends.

U. Framing and Bracing: Framing, bracing, supporting members, and centering shall be of ample size and strength to safely carry, without deflection, all dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent any bulging or sagging of forms. Concrete out of line, level, or plumb will be cause for rejection of the whole work affected. Distribute bracing loads over base area on which bracing is erected. When placed on ground, protect against undermining or settlement.

V. Tolerances:

1. See ACI 347

W. Chambered Corners: As indicated, provide moldings in forms for all chambering required. Moldings shall be 45-degree right triangle in profile of size required, milled from wood free from open defects.

X. Form Ties: Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties shall be placed at least one inch away from the finished surface of the concrete. The use of ties consisting of twisted wire loops will not be permitted. Inner rods shall be left in concrete when forms are stripped. All form ties shall be spaced equidistant, and symmetrical, and shall line up both vertically and horizontally.

Y. Cleanouts and Access Panels: Provide removable cleanout sections or access panels at the bottom of all forms to permit inspection and effective cleaning of loose dirt, debris, and waste material. All forms and surfaces to receive concrete shall be cleaned of all chips, sawdust, and other debris and shall be thoroughly blown out with compressed air just before concrete is placed.

Z. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

AA. Construction Joints: Construction joints shall be formed as specified in Section entitled "Cast-in-Place Concrete." Provide a surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints. Just prior to subsequent pour, remove strip and tighten form to conceal shrinkage. Construction joints shall show no "overlapping' of concrete and shall, as closely as possible, present the same appearance as butted plywood joints. Joints in a continuous line shall be straight, true, and sharp.

BB. Embedded Items: Provisions shall be made for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, and other features. No wood other than necessary nailing blocks shall be embedded in concrete. Complete cooperation shall be extended suppliers of embedded items in their installation. Secure information for embedded items from other trades as required. All embedded items shall be securely anchored in correct location and alignment prior to placing concrete, electrical and telephone conduits shall be run in concrete only upon the written approval of the Engineer. Under NO circumstances will ALUMINUM CONDUIT be permitted in concrete. No conduit larger than 3/4 inch in diameter and no plumbing pipes of any size will be permitted in concrete walls, columns, or slabs.

CC. Opening for Items Passing Through Concrete: Frame openings in concrete where indicated on architectural, structural, plumbing, mechanical, or electrical drawings. Contractor shall establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections. Contractor shall be held responsible for proper coordination of all work of this nature in order that there will be no unnecessary cutting and patching of concrete. Any cutting and repairing to concrete required as a result of failure to provide for such openings shall be paid for by the Contractor at no additional expense to the Owner.

DD. Screed: Contractor shall set screeds and establish levels for tops of concrete slabs and leveling for finish on slabs. Shape slabs to drain where required or as indicated on drawings. Before depositing concrete, all debris shall be removed from the space to be occupied by the concrete, and forms shall be thoroughly wetted. Reinforcement and inserts shall be secured in position. Freestanding water shall

be removed.

EE. Screed Supports: Screed supports for concrete over waterproof membranes and/or vapor-barrier membranes shall be of a cradles, pad, or base type, which will not puncture the membrane. Staking through the membrane will not be permitted.

FF. Shores and False Work: Contractor shall be fully responsible for the proper strength, safety, and adequacy of all false work, supports, posts, footing, etc., used on and in connection with work. False work and supports shall be adequate in size and strength to resist the loads imposed upon them without deformation, deflection, or settlement. Wedges in pairs or jacks shall be used where required to bring forms, shoring, or false work for beams, girders, slabs, and other parts of the structure to the exact elevations and uniform bearing before placing concrete. Single wedges will not be permitted. Vertical and lateral loads shall be carried to ground by formwork system or by completed structure, after is has attained adequate strength. Submit manufacturer's data for patented shores, shore splicing, and methods of shore support.

GG. Reuse and Coating of Forms: Thoroughly clean forms and recoat with specified form coating before each reuse. Do not reuse any form for exposed work which cannot be reconditioned to "like new" condition. Apply form coating to all forms in accordance with the manufacturer's specifications. Apply form coatings before placing reinforcing steel.

HH. Inspection: Prior to placing of any concrete, and after placement of reinforcing steel in the forms, Contractor shall notify the Engineer so that proper inspection may be made. Such notification shall be made at least 72 hours in advance of placing concrete to permit proper arrangements to be made for inspection.

II. Rejection of Defective Work Due to Improper Forms: Any movement or bellying of forms during construction or variations in excess of the tolerances specified will be considered just cause for the removal of such forms and, in addition, the concrete work so affected. Reconstruction of forms and new concrete shall be furnished at no additional cost to the Owner.

3.02 REMOVAL OF FORMS AND SHORES

A. The supporting forms and shoring shall not be removed until the members have acquired sufficient strength to support their weight and the loads superimposed thereon safely. The contractor will be responsible for obtaining competent personnel to determine not only the method of forming, but the sequence of removal to assure that this requirement is met. All formwork shall be removed without damage to the concrete.

B. The Contractor shall be guided in the removal of forms by ACI publication 347. The removal of forms and shoring shall be determined by the method of forming and supports. The removal of forms and shoring must be related to the strength of concrete as determined by tests of job-cured specimens in accordance with procedures outlined in ACI 347 and ACI 301 and test cylinders prepared in accordance with ASTM C31 with compression tests performed in accordance with ASTM C39.

C. Shoring shall be adequate in strength and shall be so designed and placed that the load from successive parts of the structure will be transmitted directly through the false work without creating bending or shearing stresses in the concrete. Do not remove shores until supporting members have attained sufficient strength to carry the imposed loads.

D. During the period that forms are in place on the concrete work, said forms shall be kept wet at all

times.

E. In removing plywood forms, no metal pinch bars shall be used and special care shall be taken in stripping. Start at top edge or vertical corner where it is possible to insert wooden wedges. Wedging shall be done gradually and shall be accompanied by light tapping on plywood panels to crack them loose. Do not remove forms with single jerk after it has been started at one end.

F. Forms shall be left in place as long as possible to permit shrinkage away from concrete, and plywood forms shall be left in place until all other forms around are stripped and until there is no danger of damaging the concrete due to other work in the vicinity.

G. Nothing herein shall be construed as relieving the Contractor of any responsibility for the safety of the structure.

H. After stripping, Contractor shall properly protect all concrete from damage.

3.03 JOINTS AND EMBEDDED ITEMS

A. Requirements of Chapter 6 of ACI 301 shall apply to the work.

3.04 PLACING

A. Placing of concrete shall conform to Chapter 8 of ACI 301 and ACI 304.

B. Concrete shall be conveyed to point of deposit over runways or by other means without wheeling equipment over reinforcement.

C. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. For thick walls or inaccessible portions of the forms, where spading, rodding, or forking is impracticable, the concrete shall be worked into place by mechanical vibration. The concrete shall be thoroughly worked around the reinforcement and around embedded fixtures, and into corners of the forms.

D. Prevent accumulations of water on the surface of the concrete due to water gain, segregation or other causes during placement and compaction by adjustments in the mixture. Remove any water that does accumulate. Do not place concrete in accumulated water.

E. When mechanical vibration is used, the number and type of vibrators shall be subject to the approval of the Engineer. In general, the use of vibrators shall be in accordance with the Portland Cement Association's "Specification for Vibrating Concrete", ST-26.

F. Care shall be exercised in use of vibrator to prevent segregation, sand pockets, or bleeding. Vibrator shall be moved continuously in and out of concrete, keeping stationary only a few seconds in any position.

G. Concrete shall not drop freely over 60 inches in unexposed work not over 36 inches in exposed work. Where greater drops are required, an elephant truck or other approved method shall be used. Concrete shall be placed in horizontal layers not over 12 inches thick. Chutes, if used, must slope sufficiently to insure flow or properly proportioned concrete and must be kept free of hardened or partially set concrete.

H. All slabs shall be placed for full thickness in one operation without change in proportions, screeded to proper elevation, and floated. Dusting of surfaces with cement is prohibited.

I. Concrete within any one section shall be deposited continuously so that no concrete will be placed on older concrete, which has set sufficiently to result in seams and planes of weakness within the section.

J. Adjacent surfaces shall be protected from concrete drippings, spillages or splashes. Damaged surfaces shall be cleaned immediately.

K. Concrete slabs on grade shall be one course construction. Thickness and reinforcing shall be as shown on drawings. Construct contraction joints where shown on drawings with a grooving tool or with plastic or steel preformed joints. Contraction joints are to be filled with joint filler.

L. Construction joints shall generally occur at control joints and shall be tongue and groove construction. Construction joints shall be no greater than 50 feet apart. Except as otherwise shown on the drawings, construction joints shall conform to the ACI Building Code.

M. Location of concrete batches from which concrete test cylinders are made shall be recorded on the record drawings. Such drawings shall be kept on file at the job until the completion of the structure and shall be subject to the inspection of the Engineer. At completion of the structure deliver drawings to the Owner's representative.

3.05 FINISHING

A. Finish shall conform to Chapter 10 and 11 of ACI 301 except as modified herein or indicated on the drawings.

B. Ceilings: Smooth form finish.

C. Vertical Surfaces: Rubbed in locations to receive finish painting to remove joint lines and other imperfections.

D. Unless otherwise shown on the drawings, all floors shall receive a hard trowel finish and ramps shall be given a medium broom finish with no coarse aggregate visible to provide a slip-resistant finished surface.

E. Finished slab tolerances shall be class B in accordance with ACI 301.

3.06 METAL ACCESSORIES

A. Place inserts in forms at locations shown on the drawings.

3.07 CONCRETE CURING AND PROTECTION

A. General:

1. 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.
2. Starting initial curing as soon as free moisture has disappeared from the concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.

3. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at the end of the final curing period.

B. Curing Methods:

1. Perform curing of concrete by moisture curing, or liquid membrane curing, or by a combination thereof.

2. Provide moisture curing by any of the following methods:
   a. Keeping the surface of the concrete continuously wet by covering with water.
   b. Covering the concrete surface with an absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet. Place absorptive cover so as to provide coverage of the concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

3. Provide liquid membrane curing as follows:
   a. Apply the specified membrane-forming curing compound to damp concrete surfaces as soon as possible after final finishing operations are complete, but no later than 2 hours. Apply uniformly in a 2 coat continuous operation by power spray equipment or rollers in accordance with the manufacturer's directions. Recoat areas, which are to be exposed to the exterior within 3 hours after initial application. Maintain the continuity of the coating and repair damage to the coat during the entire curing period.
   b. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless the curing compound is compatible to the finish material and is acceptable to the Engineer.
   c. Do not use membrane curing compounds on surfaces which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless the curing compound is compatible to the finish material and is acceptable to the Engineer.

3.08 NOTIFICATION

A. Contractor shall notify the Engineer at least 72 hours ahead of each concrete pour, and no concrete shall be placed until all reinforcing steel has been installed by the Contractor and approved by the Engineer.

3.09 CORRECTION DURING CONCRETING

A. Capable ironworkers shall be kept on the work at all times during the placing of concrete and shall properly reset any reinforcement displaced by runways, workmen or other causes.

3.10 TESTING & CERTIFICATIONS

A. 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.

B The lab shall review design mixes for each type of concrete using previously tested and approved materials.

C Proportion mixes by either 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.

a. Concrete Compression Test - 7 day and 28 day
b. Concrete Slump Test
c. Concrete Air Content

D Furnish certified reports of each proposed mix for each type of concrete at least 30 days prior to start of installation of the work of this section.

E Furnish ready mix delivery tickets.

3.11 WEATHER

A. Concrete shall not be placed when the temperature is less than 40 degrees F and is falling.

B. ACI recommendations for placement of concrete in hot weather shall be followed.

3.12 CLEANING

A. On completion of work, all forms, shores, equipment, protective covering, and all rubbish resulting from this work, shall be removed from the premises. All concrete shall be left clean at the completion of the work.

3.13 ACCEPTANCE OF STRUCTURE

A. Acceptance or rejection of the completed work shall be based on the requirements stated in ACI 301.

B. The contractor shall assume full responsibility for strength, consistency, proportions, and handling of concrete.

C. The contractor shall keep field records of the time, date, and location of placing, curing, removal of forms, etc., of the concrete in each portion of the work. Such record shall be open to inspection, shall be kept until completion and turned over to the Owner's Representative.

3.14 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas:

1. Repair and patch defective areas with cement mortar immediately after removal of forms, but only when directed by the Engineer.

2. Fill holes extending through concrete by means of a plunger-type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to ensure complete filling.

B. Repair of Formed Surfaces:

1. 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 Engineer. Surface defects, as such, include texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and

holes left by rods and bolts; fins and other projections on the surface; and stains and other discolorations that cannot be removed by cleaning.

2. Repair concealed formed concrete surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete having defective surfaces. Surface defects, as such, include cracks in excess of 0.01" wide, cracks of any width and other surface deficiencies, which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, and spalls except minor breakage at corners.

3. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, down to solid concrete but, in no case, to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water, and brush-coat the area to be patched with neat cement grout. Proprietary patching compounds may be used when acceptable to the Engineer.

C. Repair of unformed surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to the tolerances specified for each surface and finish. Correct low and high areas as specified.

2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope. Correct high and low areas as specified.

3. Repair finished unformed surfaces that contain defects.

4. Correct high areas in unformed surfaces by grinding after the concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.

5. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out the low areas and replacing with proprietary patching compounds acceptable to the Engineer.

6. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4" clearance all around. Dampen all concrete surfaces in contact with patching concrete and brush with a neat cement grout coating, or use concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same type or class as the original adjacent concrete. Place, compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

7. Repair isolated random cracks and single holes not over 1" in diameter by the dry-pack method. Groove the top of cracks, and cut out holes to sound concrete and clean out dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with a neat grout coating. Place dry-pack before the cement grout takes it initial set. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than 72 hours.

8. Repair methods not specified may be used, subject to the acceptance of the Engineer.

D. Products:

1. Bonding Compound: The compound shall be a polyvinyl acetate, rewettable type.

2. Epoxy Adhesive: The compound shall be a two (2) component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces.

3.15 DEFECTIVE WORK

A. The following reinforcing steel work will be considered defective and may be ordered by the Engineer to be removed and replace by the Contractor at no additional cost to the Owner.

1. Bars with kinks or bends not shown on drawings.

2. Bars injured due to bending or straightening.

3. Bars heated for bending.

4. Reinforcement not placed in accordance with the drawings and/or specifications.

END OF SECTION

SECTION 03 5216

LIGHT WEIGHT INSULATING CONCRETE

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

A. Lightweight fill and Roof Insulation.

B. All materials and accessories required for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Mix Design: Indicate materials and proportions of proposed mix.

C. Manufacturer's specifications and other data needed to prove compliance with specified requirements.

D. Manufacturer’s letter of certification of the approved installer.

E. Manufacturer’s installation instructions recommended for this installation.

1.3 REFERENCES

A. American Society for Testing and Material:
ASTM A150- Standard Specification for Portland Cement
ASTM A172- Standard Practice for Sampling Freshly Mixed Concrete
ASTM C332-77a, Lightweight Aggregates for Lightweight Concrete, Group 1
ASTM C495. Compressive Strength of Lightweight Insulating Concrete
ASTM C513-Standard Test Method for obtaining Specimens of Hardened Lightweight Insulating Concrete for Compressive Strength.
ASTM C578-Rigid Cellular Polystyrene Thermal Insulation
ASTM C796- Foaming Agents used in Producing Cellular Concrete using Preformed Foam.
ASTM C869-Foaming Agents used in Making Preformed Foam for Cellular Concrete.
ASTM C1077- Concrete and Concrete Aggregates for use in Construction and Criteria for Testing Agency Evaluation.
ASTM E119- Fire Tests of Building Construction and Materials.
ASTM E329 Construction Inspection, Testing and Special Inspection.

B. Comply with all applicable recommendations of American National Standard Institute (ANSI) Spec. A122.1, and any others referred to herein. In any conflict between referenced standards, the more stringent requirements shall govern.

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.

B. Building/Construction Components:
   01 Meet or exceed established standards.

D. Testing Laboratory Services:
   01 The Owner will select the Testing Laboratory and pay for the cost of tests to determine the dry density; compressive strength shall be determined in accordance with ASTM C495.
   02 Test results shall meet or exceed established standards. Refer to Section 01 4529- Testing Lab Service.

E. Laboratory Systems:
   01 The system shall conform to the requirements of Factory Mutual.
   02 Roof Deck assembly shall conform to wind uplift required by IBC 2012 edition and City of Houston Amendment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Celcore Inc. (Basis of Design)

B. Elastizell

C. Siplast

D. Vermiculite Products, Inc.

E. Mearlcrete

2.2 LIGHT WEIGHT CONCRETE

A. Aggregate:
   01 Vermiculite: Comply with ASTM C332. Mix shall be 1:6 with 125 to 225 psi at 28 days compressive strength; 44 to 60 pcf wet density, and 22 to 28 pcf dry density.
   03 Elastizell: Comply with ASTM C796. Minimum compressive strength of 160 psi at 28 days, oven dry density of 30 pcf minimum at 28 days, and wet density of 34-42 pcf.

B. 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 200 psi.

C.. Cement: Portland, conforming to ASTM C150, Type I, I/II or III.

D. Admixture: As recommended by aggregated supplier.

E. Water: Free from any materials harmful to concrete or structural steel deck.

F. Expansion Joint Material: 1" thick fiberglass approved by the manufacturer for use in conjunction with and insulating concrete deck.

F. Reinforcing Fibers: shall be monofilament type and shall not exceed 1.5 pcy.

G. Metal Deck:
01 Refer to structural drawings for size, type and section modulus of metal deck.

2.2 INSULATION BOARD

A. Rigid, closed cell, un-faced Expanded Polystyrene (EPS) board stock complying with ASTM C578.

B. Nominal Density: 1.0 PCF, Type I.

C. Fire Resistance: Flame spread- ASTM E84. Smoke Density-ASTM E84.

D. Provide a minimum of six (6) 3" diameter bond holes for each 8 SF of board.

E. Board Thickness: as shown on Drawings.

2.2 DESIGN OF THE ROOF DRAIN

A. The design to drain roof areas is generally accomplished by sloping the underlying steel structure to the roof drains or gutters.

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 pattern shown or required to facilitate full drainage of the roof surface.

C. All areas to slope at ¼" per foot unless noted otherwise.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Prior to erection of forms, inspect structural supports to ensure that they are secure and in place.

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. Notify other trades of dates of pouring in ample time for each to install his work.

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 acceptable deck.
03 Do not place insulating concrete deck during precipitation or when there is a likely expectation that precipitation will occur during installations.
04 Adverse weather precaution, 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. Metal Deck (Vented):
   01 Place sheets with corrugation edges upon the perpendicular to supports with end laps centered over supports. Attach to supports with plug welds through welding washers. At end lap, weld top sheet in valley of side lap. Refer to structural drawings for additional requirements.

B. Expansion Joint Material - Install at the following locations:
   01 Perimeter of deck
   02 Changes in direction of roof deck
   03 Structural roof penetrations and expansion joints
   04 Across dimensions exceeding 200 feet

C. Reinforcing: If required, install reinforcing to comply with UL 90, Wind Lift Classifications.

F. Fill valleys/voids of structural metal deck with a leveling thickness of lightweight concrete fill.

G. Install EPS rigid insulation board in the fresh bond coat of lightweight concrete fill in such a manner that the underside of insulation boards making full coverage contact with bond coat layer.

H. Held back the EPS Board 3(+) inches from the perimeter/edges of the roof deck. Fill voids with lightweight concrete fill.

I. The EPS layer shall be placed and allowed to set overnight, undisturbed, prior to installation of the lightweight concrete roof deck topping layer.

J. 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.

K. Where indicated on the drawings, increase depth of lightweight concrete fill as required to form crickets, etc.. required for positive drainage.

L. Screeds shall be set so various deck thicknesses are maintained uniformly in place with all slopes as shown and detailed on drawings.

M. Cure roof deck topping in strict accordance with printed instructions of manufacturer.

N. Certification: On completion of installation, furnish Architect with certificate signed by a representative of the manufacturer and by the applicator stating that insulating concrete was prepared and applied in accordance with manufacture's recommendations.

O. Concrete shall be allowed to dry as thoroughly as possible before application of roofing (not less than 5 days). General Contractor shall be responsible for protection of roof deck from other trades until it has been approved for traffic by applicator.

P. Run water on the finished deck for the Architect's observation. The insulating concrete shall slope to drain and no ponding of water will be accepted.

3.3 FIELD QUALITY CONTROL

A. Testing Laboratory:
   01 Perform the appropriate tests upon notification by Contractor.

B. Applicator:
   01 Applicator shall have test equipment available on job site at all times during pouring of insulating concrete for testing slump and wet density. Slump shall not exceed 5 inches.

C. Coordinate with the Roofing System Installer. The roof deck should not be left exposed for longer than 5 to 7 days following open-air cure period.

3.4 ADJUSTING AND CLEANING

A. Where underside of forms is exposed to normal view, remove visible insulating concrete.

END OF SECTION

SECTION 04 2000

UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INC INLUDES

A. Face Brick

B. Stone Veneer Mansory

C. Thin Clad Stone Masonry

D. Concrete Masonry Units (CMU)

E. Concrete Pavers

F. Mortar, Grout, reinforcement, anchorages, flashing and accessories shown, specified or required to complete work.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

C. Samples
   01 General: Do not start masonry until Architect has approved:
      a. Sample panel: Provide sample panel as shown 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.

1.3 QUALITY ASSURANCE

A. Reference
   01 American Society for Testing and Materials
      ASTM A153, Zinc Coating (Hot Dip) on Iron & Steel Hardware
      ASTM C67, Sampling & Testing Brick & Structural Clay Tile
      ASTM C90, Hollow Load-Bearing Concrete Masonry Units
      ASTM C652, Hollow Brick (Hollow Masonry Units Made from Clay or Shale)
      CRSI, "Manual of Standard Practices"

B. Tests and Inspections
   01 Architect may require tests and inspections as necessary to verify quality and strength of brick materials, mortar, grout, and workmanship. Laboratory tests of materials, mortar, and grout will be made per ASTM standard procedures.

   02 Owner will select Testing Laboratory and Owner will pay for all work required by Testing Laboratory.

C. Delivery, Storage and Protection
   01 Deliver and store materials in dry protected areas off ground. Keep free of stain or other damage before, during and after installation. Replace any damaged material at no cost to Owner.

D. Site Conditions
   01 Cold Weather Protection:

a. 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.

02 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.

E. Bracing of Masonry during Erection
01 All masonry shall be adequately braced at all times during erection.

1.6 TESTS AND INSPECTIONS

A. Material and installation of masonry shall be subject to testing and inspection by an independent testing laboratory. Such tests and inspections shall not relieve Contractor of responsibilities for providing material and procedures which comply with Contract Documents. Promptly re ove and replace materials which do not comply.

B. Owner will select Inspection and Testing Laboratory and will pay for all Work required by Inspection and Testing Laboratory.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Face Brick
01 As specified

B. Stone veneer masonry and Thin-clad Stone Masonry
01 As specified

C. Concrete Masonry Units
01 Headwaters Construction Materials
02 Featherlite Building Products
03 Revels Block & Brick Co.
04 IPC

D. Masonry Reinforcing, Anchors and Ties
01 Holmann & Barnard (HB)
02 Heckmann Building Products
03 Wire-Bond

E. Mortar Dropping Deflector
01 Mortar Net
02 Hohmann & Barnard
03 Heckman
04 Polyguard Products

G. Concrete Pavers
01 Paverstone

G. Masonry Cleaning Materials
01 Prosoco
02 Diedrich Technologies

2.2 MATERIALS

A. Face Brick:

01 Modular size (3-5/8” x 7-5/8” x 2-5/8”) stretcher units and special shaped units as shown.
02 Color “A” – “Color Ceramics” Cove Grey
Color “B” – “Kansa Brick & Tile” Mid Grey
03 Color “C”- “Kansas Brick & Tile” Charcoal.

B. Stone Veneer Masonry & Thin Clad Stone Masonry:
01 Material. Calcium Silicate Manufactured Stone Masonry to ASTM , Grade SW; solid units that have been pressure formed and autoclaved.
02 Size (3 5/8" x 11-5/8" H x 23 5/8" L") units as shown.; Thin Clad units: ¾" x 11-5/8" x 23 5/8".
03 Color: Tan. "Renaissance Masonry Units" by Arriscraft.
04 Texture: Smoot finish on exposed faces and ends at corners.

C. Concrete Masonry Units (CMU):
01 Face Dimensions: 8" x 16", modular depths as indicated on drawings
02 Color shall be standard
03 Comply with ASTM C90 (class D-2 block at rated walls)
a. Grade: N, highest standard
b. Type: I, Moisture -controlled unit
c. Aggregate: Lightweight
04 Curing: Rotary kiln process
05 Provide bullnose units at all outside corners, except at ceramic tile.
06 Complete with bond beam, control joints, jambs, lintels soaps and fillers to match and compliment block units.
07 Refer to structural drawings for additional requirements.

D. Concrete Pavers:
01 Equal to Paverstone "Cobble Stone" 3 way.
01 Sizes: 4 ½"x2 ¼"; 4 ½"x4 ½" and 4 ½" x 6 13/16"
03 Thickness: 2 ¾"
04 Pattern: Random Mosaic

E. Mortar:
01 Materials for Mortar:
a. Hydrated Lime: ASTM C-207, TYPE "S"
b. Portland Cement: ASTM C-150, Type 1.
c. Water: Clean and potable
d. Sand: ASTM C-144
02 Mix Design: (Proportions by volume)
a. Type: ASTM C-270, Type "S"
b. Proportions: 1 part cement, 1/2 part hydrated lime and 4-1/2 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.
d. Do not use calcium chloride

H. Adhered Masonry Veneer Mortar
01 Latex-Portland Cement Mortar for leveling beds and scratch/plaster coats: Laticrete premium Mortar bed to meet the following physical requirements:
a. Compressive Strength (ANSI A118.4 Modified): >4000 psi
b. Water Absorption (ANSI A118.6): <5%
c. Service Rating (TCA/ASTM C627): Extra Heavy
d. Smoke & Flame Contribution (ASTM E84 Modified: 0
e. Total VOC Content: <0.05 mg/m3
02 Latex Portland Cement Mortar: Laticrete Hi Bond Masonry Veneer Mortar to be weather frost, shock resistant, non-flammable and meet the following physical requirements:
a. Compressive strength (ANSI A118.4): >2,500 psi
b. Bond Strength (ANSI A118.4)
c. Smoke & Flame Contribution (ASTM E84 Modified): 0
d. Total VOC Content: >0.05 mg/m3
03 Latex Portland Cement Pointing Mortar/Grout: Laticrete Premium Masonry Pointing Mortar to be weather, frost and shock resistant, as well as meet the following physical requirements:

a. Compressive Strength (ANSI A118.7): 4500 psi
b. Tensile Strength (ANSI A118.7): > 500 psi
c. Flexural Strength (ANSI A118.7): > 1,250 psi

d. Water Absorption (ANSI A118.7): <5%
e. Linear Shrinkage (ANSI A118.7): <0.05%
f. Smoke & Flame Contribution (ASTM E84 Modified): 0
g. Total VOC Content: <0.05 mg.m3

04. Expansion and Control Joint Sealant: Laticrete Latasil to be a one component, neutral cure, exterior grade silicone sealant and meet the following requirements:
a. Tensile Strength (ATN C794): 280 psi
b. Hardness (ASTM D751, shore A0: 25 (colored sealant)
c. Weather Resistance: 10000 hours (no change).

I. Mortar Colors:
01 Concrete Masonry Units: Use standard cement color.
02 Brick: Standard cement color.
03 Stone Masonry: Tan

J. 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 (-) ½".
04 Deflector shall be non-corrosive.

K. Reinforcement/Tie Systems:
01 General: Reinforcement used in all wythes shall be galvanized after fabrication in accordance with ASTM A153.
02 At Solid Multiple Wythe Masonry Walls and Single Wythe Masonry Walls (Interior Partitions): Use #9 gauge truss type reinforcing. Pre-fab corners and tees shall be used at all wall corners and intersections; width shall be 2" less than nominal thickness of walls. Equal to Dur-O-Wal "Truss" at single wythe; "Trirod" at multiple.
03 At Double Wythe Cavity Walls with Insulation Board: Use #9 gauge truss type with 3/16" adjustable pintle wall ties. Width of truss reinforcement shall be 2 inches less than the nominal thickness of wall. 3/16" wall tie eye sections welded at 24" o.c. extended as required for insulation thickness. Pre-fab corners and tees shall be used at all wall corners and intersections. Equal to Dur-O-Wal "Dur-O-Eye".
04 At All Veneer Brick Walls with Metal Stud Partitions Back-up Wall: Triangular tie and screw on anchor strap. Triangle anchor shall extend to 3/4 inch from outside face of veneer. Equal to "Heckman" No. 316.
05 At all Veneer Brick Anchored to Steel Spandrel Beam and Columns: Equal to Heckman No. 312 Anchor and No. 258 Pintle Tie. Anchors detailed on structural drawings supersede.
06 At Veneer Brick anchored to cast-in place concrete: Equal to Heckman No 305 Dovetail slot and #303 corrugated dovetail ties.
06 Control Joint Anchor: Equal to Heckman No. 351 anchor at brick veneer, and No. 350 at block walls.
07 Cast Stone Anchors
01 Design is based on HB no. 309 and no 309-H or similar anchor as recommended by the Cast stone manufacturer.
02 Coordinate as required for proper type, length, size and quantities.

L. CMU Reinforcing
01 See General Notes on Structural Drawings.

M. 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 ProSo Co., Irving, Texas.

Form: Clear to slight amber color liquid
Specific Gravity: 1.117
pH: 0.3 (1:6 dilution)
Flash Point: None
Freeze Point: -30° F (-34.4° C)

Wt/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 ProSo Co., Irving, Texas.
Form: Clear to slight amber color liquid
Specific Gravity: 1.117
pH: 0.3 (1:6 dilution)
Flash Point: None
Freeze Point: -30° F (-34.4° C)

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 ProSo Co., Irving, Texas.

Form: White powder
Flash Point: None
Specific Gravity: 1.00
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.

PART 3 - EXECUTION

3.1 PREPARATION OF MATERIALS

A. Concrete Masonry Units
01 Where cutting is required, masonry shall be cut with a sharp masonry saw.

B. Brickwork: Dampen brick before laying in a manner consistent with the nature of the brick, the mortar, and the weather conditions.

C. Stone Veneer Masonry:
01. Cut masonry units with wet-saw.
02. Pre-soak units using clean water prior to cutting.
03. Clean cut units using a stiff fibre brush and clean water. Allow units to surface dry prior to placement.
04. Finish cutting edge to match face when expposed in wall.

C. Mortar and Grout:
01 Use suitable containers for material measurement. Measuring sand by the 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.

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.
03 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 bay or 20'
   02 1/2" in 40' (1:960)

3.3 INSTALLATION

A. General:
   01 Do not use chipped brick or chipped block where exposed to view.
   02 Verify the substrate to be covered with adhered masonry veneer brick is sound, rigid and conform to the specified subsurface tolerance. Do not level the substrate with gypsum or asphalt based compounds.
   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.

B. Metal Door Frames: Fill jamb frames solid with mortar. Build in anchors.

C. Lintels and Bond Beams: Provide reinforced unit type, except where steel lintels are shown. Use reinforcing bars as shown on the drawings. With concrete, completely fill in lintel block and bond beams. Provide 8 inch bearing at end of lintels.

D. Corners: Connect corners with No. 9 galvanized wire or corrugated tie using one tie for each 4 inches of nominal wall thickness.

E. Partitions Tops: Allow space at top of horizontal spanning walls for compressible joint back-up and sealant as specified in Sealant section. Anchor top of walls to deck or structure.

F. 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 will full mortar coverage on horizontal and vertical 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.

G. Mortar Joints and Patterns:
   01 Lay brick in one-half bond pattern. Unless otherwise shown.
   02 Lay standard CMU in stack bond pattern.
   03 Lay Stone Masonry in one-half bond pattern unless otherwise shown.
   03 Provide flush joints where concealed from view and where dampproofing is scheduled.
   04 Provide standard concave tooled joint where masonry is exposed to view for brick, stone and CMU, typically.
   05 All mortar joints to be of consistent size.
   06 Masonry walls scheduled to receive an applied base shall have first course joints flush, not tooled.

H. Reinforcement/Tie Systems:
   01 General:
      a. Completely embedded in mortar or grout

b. 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.

c. Truss reinforcing within each wythe shall be at 16 inch o.c. vertically for exterior wythes and back-up wythes, whether detailed or not.

d. 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 24 inch o.c. vertically.

e. Veneer anchors at Interior brick walls with metal stud back up shall be the same as paragraph "D" above, except anchors shall be attached directly to metal stud with cadmium plated sheet metal screws.

f. 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).

g. In cavity walls with CMU back up, embed truss type horizontal reinforcement with integral wall ties every 24 inches o.c. vertically.

h. 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.

i. Corrugated strap ties shall not be used as veneer anchors.

j. Place joint reinforcement in the first two bed joints above and the first two bed joints below masonry openings.

k. Provide masonry ties at floor and roof decks as indicated.

I. Membrane Waterproofing/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.

J. Weepholes:

01 Provide weepholes in head joints in first course immediately above all flashing at all exterior brick walls.

02 Leave head joint free and clean of mortar. Provide a temporary strip of rope at each weep to be removed upon completion of panel.

03 Spacing: 32 inch o.c. maximum @ modular size brick; 30 inch 0.c. maximum @ king size brick.

04 Keep weepholes and area above flashing free of mortar droppings.

K. 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: As shown on the drawings, but not less than 1/4 inch.

04 Provide sample for Architects approval.

L. 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 Provide control joints in brick as shown or 30’ o.c. maximum.

03 Provide control joints in stone as shown or 25’ o.c. maximum.

03 Place control joints in CMU as indicated on the drawings or at 20’ o.c. maximum. Also, provide CMU control joints directly over concrete slab control joints. Provide control joints at structural columns to isolate movement from continuing or intersecting walls and columns. See additional notes on Structural Drawings on CJ requirements.

M. Cavity:

01 Keep cavity clean using wood strips with attached wire pulls on metal ties.

03 Remove and clean wood strips prior to placing each succeeding row of metal ties.

04 As work progresses, trowel all protruding fins in cavity flat on inner surface of wythe.

N 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.

O Concrete Pavers:
01 Cut grade 8" below the concrete paver grade.
02 Place minimum 4" lime stabilized sand on compacted subgrade.
03 Place 1" of leveling sand.
04 Lay Pavers on sand in random mosaic pattern with 1/8" joints.
05 Fill joints with sand and tamper the pavers with a vibrator compactor to ensure the pavers Settle in the bedding sand and creates 8,000 psi of pressure between all of the pavers and surrounding concrete.

3.4 CLEANING

A. At completion of the work, fill and retool holes in joints of exposed masonry surfaces with mortar. After pointing has set and hardened, clean exposed masonry surfaces with cleaning agent recommended for each type of masonry used. Leave masonry clean, free of mortar daubs and with tight mortar joint throughout. After brickwork is set, protect all edges and corners from damage. The cleaning shall be in accordance with manufacturers printed instructions for type of cleaning agent used.

B.

3.5 PROTECTION

A. Cover over all unfinished work at work stoppage against the elements with plastic sheet, building paper, heavy canvas or other material approved by Architect to prevent water from entering cavities.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Perform all work necessary and required for the construction of the project as indicated. Such work shall include, but is not limited to the structural steel work as indicated on the drawings and as specified in this section of the specifications.

B. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Concrete formwork.
2. Cast-in-place concrete.
3. Steel joists.
4. Miscellaneous metal.
5. Metal deck.
6. Sprayed fireproofing
7. Intumescent Fieproofing

1.02 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following, except as otherwise indicated.

1. AISC "Code of Standard Practice for Steel Buildings and Bridges", latest edition.
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", latest edition.

B. AISC "Specifications for the Structural Joists Using ASTM A325 or A490 Bolts", latest edition.

C. AWS D1.1 "Structural Welding Code."

1.03 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing complete details and schedules for the fabrication and shop assembly of members.

PART 2 PRODUCTS

2.01 MATERIALS

A. Rolled Steel Shapes: ASTM A992. Rolled Steel Plates, Angles, Channels and Bars: ASTM A36.

B. Structural Steel Tubular Products: Hot-formed structural quality carbon steel, welded or seamless, as follows:

1. Square, Rectangular and Special Shapes: ASTM A500

2. Structural Steel Pipe: ASTM A501

C. Unfinished Bolts and Nuts: ASTM A307, Grade A.

D. High Strength Bolts and Nuts: ASTM A325 or A490.

E. Cement Grout: Portland cement and clean sand, mixed at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with only the minimum amount of water required for placement and hydration.

F. All steel and bolts shall be domestically fabricated. Provide certification that all steel and bolts are domestic in origin.

2.02 FABRICATION

A. General: Fabricate items of structural steel in accordance with AISC Specifications and the final approved shop drawings. Properly mark and match all materials for field assembly.

B. Connections:

1. Combinations of bolts and welds in the same connections are not permitted, unless otherwise detailed.

2. Weld shop connections, unless otherwise shown or approved.

3. Bolt field connections, except where welded connections or other connections are shown or specified.

4. Provide high-strength bolts and nuts where shown.

C. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and for methods used in correcting welding work.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for the passage of other work through steel framing members. Provide openings in structural members only as shown on the Structural Drawings or as directed by the Engineer. Provide threaded nuts welded to framing and other specialty items as shown to receive other work.

E. Shop Painting: Apply shop coat to all structural steel that will not be fireproofed or galvanized. Omit paint also at friction connections as required. Remove loose scale, heavy rust and other foreign materials from all steel that is to be painted or not painted. Apply one shop coat of paint, conforming to SSPC Paint 15-68T, Type 1, to structural steel and accessories. Provide a continuous dry paint film thickness of not less than 1.0 mil.

PART 3 EXECUTION

3.03 ERECTION

A. Comply with the AISC Specifications and Code of Standard Practice. Maintain work in a safe and stable condition during erection.

B. Temporary Shoring and Bracing: Provide as required, with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds, as required.

C. Anchor Bolts: Furnish anchor bolts and connectors required for securing structural steel to foundations and other in-place work.

D. Setting Base Plates:

1. Clean bearing surfaces and dampen, remove excess mortar.

2. Set base plates for structural members on wedges, or other adjustable devices. Tighten anchor bolts after the supported members have been positioned and plumbed. No not remove wedges or shims, but cut off flush with the edge of the base plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces.

E. Field Assembly:

1. Set Structural members to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces, which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

2. Splice members only where shown or specified.

3. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts and weld connection continuously.

4. Do not use gas-cutting torches in the field for correcting fabrication errors in the structural framing, except on secondary members, which are not under stress. Finish gas-cut sections equal to a sheared appearance.

5. Notify the Engineer of action taken to correct members that do not properly fit.

END OF SECTION

SECTION 05 2100

STEEL JOISTS FRAMING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Perform all work necessary and required for the construction of the project as indicated. Such work includes, but is not necessarily limited to the furnishing and installing of steel joists as shown and noted on the drawings and specified herein.

B. Related Work in Other Sections: The following items of associated work are included in other sections of these specifications.

1. Structural Steel.

2. Metal Decking.

3. Miscellaneous Metals.

1.02 CODES AND STANDARDS

A. Codes and Standards: Steel Joists Institute "Standard Specifications for Open Web Steel Joists"; comply with applicable provisions except as otherwise indicated.

B. Qualifications of Welding Work: Quality welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure".

1. Joists welded in place are subject to inspection and testing. Remove and replace work found to be defective and provide new acceptable work.

1.03 SUBMITTALS

A. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include the mark number, type, location and spacing of joists and bridging.

B. Certification: Submit certificate of compliance with SJI “Specifications”.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle steel joists as recommended in SJI “Specifications”. Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel: Comply with "Codes and Standards" as referenced herein.

B. Prime Paint: Comply with "Shop Painting" specified hereinafter.

2.02 FABRICATION

A. Refer to General Notes on Structural Drawings.

1. Splicing of principal members shall comply with the recommendations of the Steel Joist Institute.

2. Allowable Deflection: Design and fabricate steel joists for a maximum deflection of 1/360 of the clear span under the design live load.

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to the steel joists.

C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications" and load tables.

D. Ceiling Extensions: Provide ceiling extensions for ceilings attached directly to joists bottom chord, when shown on the drawings. Provide either and extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support the ceiling construction. Extend ends to within ½ inch of the finished wall surface unless otherwise indicated.

E. Shop Painting: Remove loose scale, heavy rust and other foreign materials. Apply one shop coat of paint, conforming to SSPC Paint 15-68T, Type 1, to metal joists and accessories. Provide a continuous dry paint thickness of not less than 1.0 mil.

PART 3 EXECUTION

3.01 ERECTION

A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.

B. Placing Joists:

1. Do not start placement of joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate location and spacing before permanently fastening.

2. Provide temporary bridging, connections and anchors as required to ensure lateral stability during construction.

3. Install permanent bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines to steel beams or bearing walls.

4. On spans 40 feet or longer install one row of bolted "X" bridging near center span of joists before slackening of hoisting lines.

C. Touch-Up Painting: Cleaning and touch-up painting of field welds, abraded areas, and rust spots

shall be done at the completion of steel erection.

END OF SECTION

SECTION 05 3100

STEEL DECKING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Perform all work necessary and required for the construction of the project as indicated. Such work includes, but is not necessarily limited to the furnishing and installing of metal decking as shown and noted on the drawings and specified herein.

B. Related Work in Other Sections: The following items of associated work are included in other sections of these specifications:

1. Structural Steel.

2. Steel Joists.

3. Miscellaneous Metals.

1.02 CODES AND STANDARDS

A. Comply with the provisions of the following codes and standards:

1. AISI "Specifications for the Design of Cold-Formed Steel Structural Members".

2. AWS "Structural Welding Code".

3. SDI "Design Manual for Floor Decks and Roof Decks".

B. Qualification of Welding Work: Quality welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1.03 PERFORMANCE REQUIREMENTS

A. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 pounds per square foot.

B. Allowable Deflection: Design and fabricate deck for maximum deflection of L/240 of the clear span under the total uniform dead and live load indicated

C. Underwriters' Label: Provide metal deck units listed in UL "Fire Resistive Directory", bearing UL label and marking for the system detailed.

1.04 SUBMITTALS

A. Shop Drawings and Data: Show complete details and schedules for layout and types of deck panels, anchorage, supplementary framing, cut openings and accessories.

B. Manufacturer's Data: Submit 2 copies of manufacturer's specifications and installation instructions

for each product specified.

C. Certification: Submit certificate of compliance with the Specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel for Galvanized Units: ASTM A446, Grade A (unless indicated otherwise on Structural General Notes); ASTM A525, G90 zinc-coating.

B. Steel Shapes: ASTM A36.

C. Sheet Metal Accessories: ASTM A526 with A525, G90 zinc-coating.

D. Galvanizing Repair Paint: MIL-P-21-35 (Ships).

2.02 FABRICATION

A. General: Form deck units in lengths to span at least 3 supports; flush, telescoped, or nested 2 inch end laps; nested or interlocked side laps. Refer to Structural Drawings for additional requirements. All deck to comply with the Steel Deck Institute Specifications.

B. Accessories: Provide cover plates and roof sump pans as required, use deck manufacturer's standards.

C. Metal Closure Strips: Fabricate metal closure strips for openings between decking and other construction, of not less than 18 gage sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cutting and Fitting: Cut and fit deck units and accessories around other work projecting through or adjacent to the decking as shown on the Drawings. Provide neat, square and trim cuts.

B. Reinforcement at Openings:

1. Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown on the Drawings.

2. Reinforce decking around openings 6 inches to 12 inches in size by means of a flat galvanized steel sheet placed over the openings on the top of decking and fusion welded to the surface of the deck. Provide not less that 18 gage steel sheet of the same quality as the deck units, at least 12 inches wider and longer than the opening, unless otherwise indicated. Space welds at each corner and not more than 12 inches on center along each side.

C. Place deck units and secure to adjacent framing by fusion welding through welding washers. Secure units at ends and side laps at spacings as specified.

D. Place accessory units in accordance with manufacturer's recommendations.

E. Clean field welds and abraded areas, and apply galvanized repair paint on damaged galvanized surfaces.

END OF SECTION

SECTION 05 4000

COLD-FORMED METAL FRAMING (Light Gauge Framing)

PART 1 GENERAL

1.01 SUMMARY

A. Types of cold-formed metal framing units include the following:

1. C-shaped load-bearing steel studs.

1.02 SUBMITTALS

A. Comply with Section 01 3300.

B. Product data and installation instructions for each item of cold-formed metal framing and accessories.

C. Shop drawings: submit cold rolled metal studs and connection shop drawings and calculations signed and sealed by a Texas registered Engineer.

1. Design Load Criteria: See structural drawings.

1.03 QUALITY ASSURANCE

A. Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members.

B. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code -Sheet Steel."

C. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units that have been approved by governing authorities that have jurisdiction.

D. Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. Dietrich Industries, Inc.

2. Unimast Incorporated

3. Delta Metal Products

4. Wheeling Corrugating Co.

5. Nucor Building Products

2.02 METAL FRAMING

A. System Components: Manufacturer's standard load-bearing steel studs and joists of type, size, shape, and gage as indicated. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.

B. Materials and Finishes:

1. For 16-gauge and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.

2. For 18-gauge and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A611.

3. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.

4. Fasteners: Provide nuts, bolts, wahsers, screws, and other fasteners with corrosion-resistant plated finish.

5. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.

6. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.03 FABRICATION

A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels, plumb, square, true to line, and braced against racking with joists welded. Perform lifting of prefabricated units to prevent damage or distortion.

1. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding,

bolting, or screw fasteners, as standard with manufacturer.

1. Wire tying of framing components is not permitted.

C. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches o.c. spacing for nail or power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

C. Installation of Wall Studs: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.

D. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

E. Where stud system abuts structural column or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

F. Install supplementary framing, blocking, and bracing in metal framing system wherever wall or partitions are indicated to support fixtures, equipment, services, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

G. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below all wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs smae as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

H. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

I. Install horizontal stiffeners in stud system, spaced (vertical distance) at no more that 54 inches o.c. Weld at each intersection.

J. Erection Tolerances: Weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true to line joints.

1. Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.

K. Field Painting: Touch-up damaged shop-applied protective coatings. Use galvanizing repair system for galvanized surfaces.

END OF SECTION

SECTION 05 5000

METAL FABRICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Loose Lintels

B. Metal Pan Stairs

C. Steel Railing

D. Expansion Joint Covers

E. Framing supports

F. Guard posts, ladders and misc. angles, steel shapes.

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1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   01 Complete shop drawings for the Architect's approval. Show all layouts, sizes, methods of construction and installation, including sizes and types of all fastening devices.

C. Certification: provide registered Structural Engineer’s seal on steel pan Stair Shop Drawings. See structural drawings for required design load.

1.3 REFERENCES

A. American Institute of Steel Construction

B. American Welding Society

C. American Society of Testing Materials

D. American Iron and Steel Institute

PART 2 - PRODUCTS

2.1 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.

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 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 Painting and Staining Section.
04 Hot-dip galvanized after fabrication.
05 Silicone protective coating shall not be used at galvanized items scheduled to receive paint.

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 plans for other miscellaneous metals. All items exposed to the exterior shall be hot-dip galvanized after fabrication.

01 Guard Post: Provide and install schedule 40 steel, 2500 psi pipe guard post as detailed on the drawings. Fill with concrete after installation. Hot dip galvanized after fabrication.
02 Steel Railing: Furnish and install 1 ½ inch diameter schedule 40 steel pipe rails as shown. Include all parts required for finished installation. All work shall be in accordance with codes and access standards. Hot dip galvanized after fabrication.
03 Steel Ladders and Loose Lintels: Fabricate from steel shapes as shown; weld joint and grind smooth. Hot dip galvanized after fabrication.
04 Steel Pan Stairs: Designated for minimum 100 PSF and 300 lbs concentrated load at tread midspan, shop welded. Fabricate stringers of channels and plates as shown; tread pans and risers of minimum 12 gauge steel sheet welded on angles minimum 1-1/4” x 1 1-4” x 3/16” to stringers and steel channel supports.
06 Expansion Joint Covers: Anodized extruded aluminum expansion joint covers, equal to C/S Group wall-to-wall Model AFW and AFWC-1. Provide rated fire barriers at rated walls. Pauling Corp. and Balco are approved manufacturers.
07 Frame Supports: Construct above ceiling frame supports for all aluminum entrances, pot racks, channels and all anchorage devices as detailed and required.
08 Miscellaneous Angles: Sizes and shapes as detailed. Use specified galvanized steel for angles at exterior conditions.

B. Miscellaneous Items: Miscellaneous metal items and their related components are not necessarily individually described. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separate all dissimilar metals.

B. Where welding is exposed to view, welds shall be executed neatly then ground smooth. Pits and blemishes are not acceptable.

C. For manufactured items, adhere to printed manufacturer's installation instructions.

D. Refer to Painting Section for items that are to receive paint.

END OF SECTION

SECTION 05 5216

METAL HANDRAIL SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Stainless Steel Handrail System

B. Infill panel

C. Fasteners and accessories required for a complete installation.

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1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   01 Complete shop drawings for the Architect's approval. Show all layouts, sizes, methods of construction and installation, including sizes and types of all fastening devices.
   02 Provide calculation from a Texas Registered Structural Engineer showing that the handrail system meets the specified performance requirements.
   03 Samples. Provide actual material samples for each finish for selection by the Architect.

D. City of Houston Approval
   01 Submit drawings to COH for required permit.

1.3 REFERENCES

A. American Institute of Steel Construction

B. American Welding Society

C. American Society of Testing Materials

E. American Iron and Steel Institute

1.4 PERFORMANCE REQUIREMENTS

A. The railing system shall be designed to conform to applicable sections of the following codes:
   01 Interanion Building Code 2021 and COH Amendments.
   02 Texas Accessibility Standards

B. The railing system shall withstand the effects of gravity loads and the following loads and stresses:
   01 Handrails and Top Rails of Guards: Uniform load of 50 lbf/ft. applied in any direction; concentrated load of 200 lbf applied in any direction. Uniform and concentrated loads need not be assumed to act concurrently.
   02 Infill Area of Guards: Horizontal concentrated load of 50 lbf applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails,

1.5 QUALIFICATIONS

A. The fabricator must have minimum of five (5) years' experience fabricating products meeting or exceeding the specifications.

B. The fabricator must be on City of Houston's approved vendor list.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Stainless steel tube, type 304. #4 satin finish.
B. Perforated infill panel: 1/8” thick, stainless steel Satin #6 finish. Pattern: equal to Vivia Railing Blade perforated.

2.2 FASTENERS & ACCESSORIES

A. General: Provide Alloy Steel fasteners with JS-600 zinc plating.

B. Fasteners, grout filler, splice connectors, setting blacks and shims, gaskets, sealants and other accessories as instructed by the fabricator for complete installation.

C. Fasten infill panels to rails and posts with panel clips and screws as recommended by the fabricator.

2.4 HANDRAILS

A. Attach handrails to the guardrail sections using adjustable brackets.

B. Handrails shall return to a wall, guard or walking surfaces.

2.5 FABRICATION

A. General: Fabricate 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. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Using connections that maintain structural value of joined pieces.

C. Cut, drill and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form works true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill and tap as indicated to receive finish hardware, screws and similar items. Welding will not be accepted.

G. Connections: Fabricate railings with non-welded connections, unless otherwise indicated. Welding will not be accepted.

H. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fillings to produce flush, smooth, rigid, hairline joints.

I. Fittings to be of the internal double tang type activated by a reverse knurl cup point set screw. Reverse Knurl is required to ensure that screw does not come loose under vibration. Plain cup point screws will not be accepted. Fittings to be fastened to pipe by means of a 5/16 in. tubular rivet nut and socket head cap screw.

J. Form changes in direction as follows: By flush bends or by inserting prefabricated flush-elbow fittings.

K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components,

L. Closed exposed ends of railing members with prefabricated end fittings.

M. Provide wall reruns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is ¼" or less.

N. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated. Flanges to be sand cast from aluminum alloy 535 with anodized finish and fattened directly to the post by means of two reverse knurl cup point set screws.

O. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine gypsum board assemblies, where reinforced to receive anchors to verify that locations of concealed reinforcements have been clearly marked for installer. Locate reinforcements and marked locations if not already done.

3.1 INSTALLATION-GENERAL

A. Install railing system in accordance with fabricator's instructions and approved shop drawings.

B. Install railing system plumb, level, square, true to line and rigid,

3.3 RAILING CONNECTIONS

A. Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.

B. Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of pot.

3.4 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using non-welded connections.

3.5 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1 ½ inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as indicated, or if not indicated, as follows:
   01. For concrete and solid masonry anchorage, use drilled in expansion shields and hanger or lag bolts.

02. For hollow masonry anchorage, use toggle bolts.
03. Provide blocking between studs in stud wall construction.

3.6 ADJUSTING AND CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.7 PROECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remans of correction work. Return items that cannot be refinished in the field to the shop, make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Miscellaneous rough carpentry and supplementary items necessary for installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Wood treatment materials

1.3 QUALITY ASSURANCE

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

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 in contact with concrete, roofing, or exposed to the weather.
- 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 framing, plates and blocking in all walls and partitions where required by building code or noted on drawings.

B. 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.

C. Rough Hardware:
   01 Nails, Spikes, and Staples: Galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations: Size and type to suit application.
   02 Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application. Galvanize for exterior locations, high humidity locations, and treated wood. Plain finish for other interior locations.
   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.

D. Wood Treatment:
   01 Preservative Treatment:
      a. Pressure impregnate with Boliden CCA or Osmose K33 (Fed. Spec. TT-W-550) preservative to net retention of .23 lbs./cu.ft., in accordance with American Wood-Preservers Association, "Book of Standards", in plant licensed by manufacturer. Stamp for identification.
      b. Brush two coats of preservative on bored or sawn surfaces of treated lumber.

PART 3 - EXECUTION

A. Wood Framing:
   01 Framing and blocking shall be accurately cut and fitted true to line and levels, avoiding shims and wedges.
   02 Spiking and nailing shall be done using largest size spikes and nail practicable.
   03 Use 2" x 4" wood studs spaced 16 inches o.c., with 4 inch face perpendicular to direction of wall or partition, unless otherwise stated. Provide single bottom plate and double-top plates 2 inches thick by width of studs.
   04 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.
   05 Provide blocking, bucks and framing as necessary and for other trades as required.

B. Plywood:
   01 Install plywood over framing in accordance with instruction of American Plywood Association Construction Guide Form No. E30C.

C. Wall Fixture Reinforcements
   01 Provide solid treated wood blocking at stud walls including, but not limited to, wall cabinets, handrails, toilet accessories, wall stops, toilet partitions, etc. as required.

END OF SECTION

SECTION 06 4000

FINISH CARPENTRY

PART 1- GENERAL

1. THIS SECTION INCLUDES:

A. Installation of finish hardware and plastic laminate doors.

PART 2 - PRODUCTS

2.1 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: Occasionally, pine knot is permitted provided it is tight and smooth. 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.

2.2 CABLING BOARD

A. Use grade stamped DFPA, grade A/D, Paint as scheduled in Section 09900. Provide 4' x 8' sheets of 3/4 inch plywood for cabling.

PART 3 - EXECUTION

3.1 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. Casework contractor shall be responsible for hardware on casework and millwork.

3.2 PLATIC LAMINATE DOOR INSTALLATION

A. Protect all doors during handling.

B. Refer to Finish Hardware - Section 08 7100 for hardware requirements.

END OF SECTION

SECTION 07 2100

BUILDING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Batt thermal insulation in stud walls

B. Rigid board cavity wall insulation.

1.2 RELATED WORK

A. Roof Insulation: Section 03 5216.

1.4 SUBMITTALS

A. Comply with Section 01 3300

B. Product Data Manufacturer's specifications and technical data.

C. Certify compatibility of rigid insulation with damp proofing mastic.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Batt or Roll Thermal Insulation:
- 01 R-Values (minimum): R-13 at walls and R-19 at attic area and elsewhere as shown.
- 02 Comply with Type 1 ASTM 665-84 unfaced
- 03 Flame Spread 25 or less
- 04 Pins and disc securement accessories as required.

B. Rigid Board Insulation
- 01 1 ½" thick
- 02 Width to fit between vertical spacings of masonry reinforcement
- 03 Thermal resistance R-5.0 per inch minimum
- 04 Water vapor transmission .7 per inch maximum
- 05 Compressive strength 20 p.s.i. minimum
- 06 Verify compatibility with damp proofing mastic.
- 07 Four (4) Foot by eight (8) foot sheets minimum size

2.2 MANUFACTURERS

A. Rigid Board Insulation:
- 01 Owens Corning "Foamular" 250
- 02 Dow Chemical Co. Styrofoam

B. Batt or Roll
- 01 Owens-Corning
- 02 Johns Manville
- 03 Certainteed

PART 3 - EXECUTION

3.1 INSTALLATION

A. Batt or Roll Insulation:
- 01 Walls:

a. Batts shall fit between studs and provide full coverage where indicated on drawings.

b. Wall Areas Above Ceiling: At sidewall insulation in ceiling cavity, install adhesive-mounted spike devices with metal caps at 2'-0" vertically, and 4 inches horizontally from each side of the blankets. Install blankets with 4 foot dimensions running vertically on spikes, keeping blankets tight to exterior wall without crushing into each other.

02 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.

B. Rigid Board Insulation

01 Install board insulation at exterior masonry walls between masonry reinforcement in accordance with manufacturer's printed instructions.

02 Secure insulation boards to back up surface with fasteners or adhesive and with joints tight to provide full coverage.

03 Take precautions to assure that insulation board is concealed with cavity wall construction.

END OF SECTION

SECTION 07 2500

AIR/MOISTURE BARRIER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Asphaltic mastic damp proofing applied to exterior of all masonry back up for exterior brick veneer.

B. Sheet air and water barriers applied to exterior sheathing boards for exterior brick veneer.

C. Supplementary items necessary for installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's specifications, Product data and manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 DAMPPROOFING

A. Equal to Henry Company #789 Fibered Emulsion meets ASTM-D-1227 Type II Federal Spec. SSR-1781 Type 1. Military Spec. Mil-R-3472 Clay Type "Except fibers are not asbestos."

B. Provide primers, glass fabric scrim tape, mastic and other materials not specifically described, as required for a complete and proper installation.

C. Approved Manufactures:
   01. Henry Company
   02 Sonneborn

2.2 AIR/WATER BARRIER

A. Equal to DuPont, Tyvek Commercial/Wrap D and related assembly components.
   01. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57 lbf/s,f. pressure difference, ASTM E2178.
   02. Vapor Permeance: Maximum 30 perms, ASTM E96/E96M, Water Method.

B. Provide barrier seaming tape, barrier flashing tape, primer. Adhesives, fasteners and other materials not specifically described, as required for a complete and proper installation.

PART 3 – EXECUTION

3.1 DAMPPROOFING INSTALLATION

A. Surface Preparation: All dust, dirt, old loose or scaling coatings should be removed from the surface before coating. All cracks, joints, penetrations, and splits should be sealed, repaired with 4 inch wide glass fabric scrim tape embedded in Henry Company #789 or treated with Henry Rub-R-Nek Wrap 25 self adhesive joint tape. 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 Emulsion which has been thinned with 1 gallon water per 5 gallons of #788. Cleaned metal surfaces should also be primed. Architect shall approve the taping of joints and surface preparation prior to the application of the dampproofing.

B. Working Conditions: Apply under normal working conditions above 45°F and rising. Do not apply when rain is imminent.

C. Application: Apply with brush or spray equipment. Soft brushes free from stiff bristles should be used and the material applied in even strokes. When spraying, apply in one coat with a 50% overlap of the spray patter to obtain a uniform and continuous coating.
   01 Ensure continuous coating free of breaks, voids and pinholes.
   02 Thoroughly cover all cracks, joints, and corners.
   03 Provide dampproofing in all exterior cavity walls on concrete masonry units, and on all gypsum board sheathing including areas above soffits, doors, and windows.

D. Coverage: Minimum 3/32 inch (2.4 mm) dry film thickness

E. Storage: Keep container tightly sealed and protect from freezing in shipping and storage.

3.2 AIR AND WATER BARRIER INSTALLATION

A. General: Install air and water barrier sheets and accessory materials according to air-barrier manufacturer's written instructions.

B. One-Piece Electrical Box: Install in accordance with manufacturer's recommendations. Cover shall project from face of wall surface enough to allow hinged cover to fully open for access.

C. Air and Water Barrier Installation: Install multiple sheets to form continuously sealed sheet air and water barrier over indicated substrates.

1. Layout and arrange seams and laps so that they will not occur over exterior gypsum sheathing joints or fasteners.
2. Beginning at bottom of substrate wall, accurately align horizontally; pull taut to eliminate fishmouths, wrinkles, buckles and kinks; install in shingled manner to shed water without interception by exposed edges.
3. Weather Barrier Attachment:

   a. Steel or Wood Frame Construction: Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 6" by 18" vertically on center along stud line, and 16" on center, maximum horizontally.
   b. Cladding Anchors: Apply 4" by 7" flashing tape to weather barrier membrane prior to the installation of cladding anchors.

4. Install overlapping upper sheet over underlying lower sheet lapping 12" minimum at horizontal joints and ends; stagger end laps; lap 12' minimum at inside and outside corners; lap flashing 6" minimum. Seal sheet to sheet seams with barrier seaming tape.

5. Form bellows at expansion or control joint locations to allow movement.

6. Seal joints and penetrations caused by pipes, conduits, electrical boxes and similar items penetrating barrier with barrier flashing tape.

7. At doors, window and other wall opening, extend or fold barrier into head, jamb and sill substrates and seal according to manufacturer's instructions. Ensure barrier at head condition is properly lapped to prevent water infiltration.

8. Repair punctures, tears, voids, damage and deficiently lapped seams with barrier flashing tape extending 6” minimum beyond damaged areas in all directions.

9. Flexible Flashing Installation: Apply flexible flashing where indicated, to comply with manufacturer’s written instructions.

    a. Prime substrates as recommended by flashing manufacturer.
    b. Lap seams and junctures with other materials.
    c. Lab flashing over water-resistive barrier at bottom and sides of openings.
    d. Lap water resistive barrier over flashing at heads of openings.
    e. After flashing has been applied, roll surfaces to ensure that flashing is completely adhered to substrates.

END OF SECTION

SECTION 075216

SBS MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Modified Bitumen Roofing System.

1. Membrane: SBS-modified bituminous membrane roofing adhered with hot asphalt.
2. Plies: Two plies of roofing felts adhered with hot asphalt.
3. Base Sheet: Mechanically attached to Lightweight Concrete deck.

B. Sheet Metal Flashing and Trims

C. Fiber Cants

1.2 RELATED SECTIONS

A. Lightweight Insulating Concrete, Section 035216.

B. Metal Roof, Section 074100.

C. Rough Carpentry for wood nailers, cants, curbs, and blocking, Section 061000.

D. Roof Accessories, Section 077200

E. Roof Drains, Division 23.

1.3 REFERENCES

A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:

1. ASTM D 1079 “Terminology Relating to Roofing and Waterproofing.”
2. Glossary of NRCA's "The NRCA Roofing and Waterproofing Manual.”
3. Roof Consultants Institute “Glossary of Roofing Terms” for definition of terms related to roofing work in this Section.

B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

C. Hot Roofing Asphalt: Roofing asphalt heated to temperature recommended by roofing manufacturer to flux modified roofing membrane and heated to its equiviscous temperature (EVT) for BUR felt plies, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F (14 deg C), measured at the mop cart or mechanical spreader immediately before application.

1.4 DESIGN CRITERIA

A. General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. Wind Uplift Performance: Roofing system shall be identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE-7, to meet the requirements of City of Houston and as indicated on the Structural Drawings.

1.5 SUBMITTALS

A. Product Data: Manufacturer’s data sheets for each product to be provided.

B. Detail Drawings: Provide roofing system plans, elevations, sections, details, and details attachment to other Work, including:

1. Base flashings, cants, and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns.

C. Verification Samples: Provide for each product specified.

D. Maintenance Data: Refer to Johns Manville’s latest published documents on www.specJM.com.

E. Guarantees: Special guarantees specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Signed by roofing system manufacturer certifying that the installer is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive the specified manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing or FMG approval for roofing system identical to that used for this Project.

C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 329.

D. Test Reports:

1. Roof drain and leader test or submit plumber’s verification.
2. Roof deck fastener pullout test.

E. Source Limitations: Obtain all components from the single source roofing system manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.

F. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class **A**; ASTM E 108, for application and roof slopes indicated.
2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

G. Warranty: Sample copy of roofing manufacturer's 20 year NDL Warranty document stating obligations, remedies, limitations and exclusions of Warranty.

H. Inspection Report: Copy of roofing system manufacturer's Inspection Report of completed roof installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

1.9 WARRANTY

A. General Warranty: The warranties 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.

B. Roofing Manufacturer's Warranty: Submit a written material and labor warranty that complies with the Owner's Warranty Requirements as listed below, or submit the warranty form at the end of this section.

1. Warranty Period: 20 years.
2. Dollar Limit: No Dollar Limit.
3. Materials Covered: Complete Roofing System (To include: roof membrane, membrane flashings, insulation, fasteners, and other manufacturer supplied accessories).
4. Providing Coverage Against: Leakage into the building or between plies of roofing material, as well as blisters, splits, excessive granule loss, delamination of insulation or facers, buckles, slippage, and etc.

C. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of the Section, signed by Installer, covering Work of this Section, including membrane roofing, base flashing, sheet metal flashings, roofing insulation, fasteners, and vapor retarders, if any, for the following warranty period:

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

A. Roofing Membrane Cap Sheet: ASTM D 6163, Grade G, Type I, reflective, glass-fiber-reinforced SBS-modified asphalt sheet; granular surfaced; suitable for application method specified. Basis of Design: DynaGlas FR CR G

2.2 ROOFING MEMBRANE PLIES

A. Glass-Fiber Base-Ply Sheet: ASTM D 2178, Type VI, asphalt-impregnated, glass-fiber felt. Basis of Design: GlasPly Premier

2.3 BASE SHEET MATERIALS

A. Glass-Fiber Base Sheet: ASTM D4601, Type II, asphalt coated, fiberglass base felt. Basis of Design: PermaPly 28

2.4 FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides. Basis of Design: PermaPly 28

B. Flashing Sheet: ASTM D 6221, Grade G, Type I, reflective**,** composite polyester and glass-fiber-reinforced, reflective, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified. Basis of Design: DynaFlex CR G

C. Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitch bonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. Basis of Design: PermaFlash System

2.5 AUXILIARY ROOFING MEMBRANE - BITUMINOUS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.

B. Roofing Asphalt: ASTM D 312, Type **IV**.

C. Asphalt Primer: ASTM D 41. Basis of Design: Asphalt Primer

D. Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, one-component, asbestos-free, trowel-grade, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Basis of Design: MBR Utility Cement

E. Mastic Sealant: As required by Johns Manville.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer.

1. LWC Base Sheet Fasteners at lightweight concrete decks.

G. Roofing Granules: Ceramic-coated roofing granules matching specified cap sheet, provided by roofing system manufacturer.

H. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.6 ROOF METAL SYSTEM

A. Roof Edge, gutter and downspouts: Precoated sheet metal edge and flashing cold formed from minimum 50,000 psi, 24 gauge galvanized steel conforming to Fed. Specs. QQS-775-C, ASTM A361 and ASTM A525, Kynar 500, Color as selected by Architect.

B. Nails, Rivets and Fastenings:

1. Nails shall be hot-dip galvanized for galvanized steel.
2. Rivets shall be tinned soft iron rivets.
3. Aluminum-flat heat, sizes as required.

C. Sealant

1. Morrison and Co., or approved CL-50 polisobutylene; include primer as required.

D. Butyl Sealer

1. Where impractical to use solder at joints, corners, etc., seal with “DAP Butyl Gutter and Lap Sealer” or “Cushion-Lock CL-50 Butyl Sealer”.

E. Counter Flashing: Galvanized prepainted metal, twenty-four (24) gauge minimum, same finish as roof edge metal.

F. Two-Piece Through-Wall Metal Flashing: invisible piece shall bel Type 302/304, 4D finish stainless steel; Visible piece shall be galvanized, Kynar 500 finish to match roof edge. Profile as shown on the Drawings.

G. Lead Flashing: ASTM B29-79 (1984), 4 ob. (1.82 Kg) sheet lead.

2.7 WALKWAYS

A. Walkway Pads: Mineral-granule-surfaced, reinforced modified asphalt composition, slip-resisting pads, manufactured as a traffic pad for foot traffic provided by roofing system manufacturer, with a pad size of 32 inch x 32 inch. Basis of Design: Johns Manville DynaTred

2.8 APPROVED MANUFACTURERS

A. Johns Manville

B. Siplast

PART 3- EXECUTION

3.1 EXAMINATION

C. General:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

D. Ensure general rigidity and proper slope for drainage.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

2.9 PREPARATION

A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.10 BASE-SHEET INSTALLATION AT LIGHTWEIGHT CONCRETE DECKS

A. Install one lapped base sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.

1. Enhance fastening rate in perimeter and corner zones according to code or manufacturer, whichever is more stringent.

B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.11 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Where roof slope exceeds 1/2 inch per 12 inches (1:24), contact the membrane manufacturer for installation instructions regarding installation direction and backnailing

D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

E. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

F. Asphalt Heating: Heat roofing asphalt to temperature recommended by roofing manufacturer to flux modified membrane and EVT for BUR plies. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.

G. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

2.12 ROOFING PLY INSTALLATION

A. Install **two ply sheets** starting at low point of roofing system. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.

1. Install each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane without ply sheets touching.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.13 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing membrane cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Adhere to substrate in a solid mopping of hot roofing asphalt applied at temperatures recommended by roofing system manufacturer.

2. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.

B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.
2. Apply roofing granules to cover exuded bead at laps while bead is hot.

C. Install roofing membrane sheets so side and end laps shed water.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

2.14 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Backer Sheet Application: Mechanically fasten backer sheet to walls or parapets.
3. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt.

B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing with a strip of glass-fiber fabric set in manufacturer’s approved cement.

D. Penetrations: Flash penetrations using roofing manufacturer’s liquid applied flashing.

E. Roof Drains: Set 30-by-30-inch 4 lb lead flashing sheet in a bed of MBR Flashing Cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches (100 mm) beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.

F. Roof Drains: Flash drain using PermaFlash system. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.

1. Install stripping according to roofing system manufacturer's written instructions.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

2.15 SHEET METAL WORK AND ROOF ACCESSORIES

A. Install sheet metal work, roof curbs, flashing and pans. Seal around pipes and other objects passing through roof with felt and mastic to prevent dripping.

B. Strip-in metal flashings and similar metal flanges with two plies of felt and mastic to prevent dripping.

C. Cooperate with other trades making installation on roof during construction.

2.16 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's Registered Roof Observer (RRO) to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

2.18 PROTECTION AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 7200

ROOF ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Prefabricated roof curbs
B. Roof Expansion Joint Covers
C. Roof Hatch

1.2 SUBMITTALS

A. Comply with Section 01 3300

B. Product Data. Manufacturer's specifications and installation instructions.

C. Shop Drawing. Indicate size, material, and finish. Show locations and installation procedures. Include details of joints, attachments, and clearances.

1.3 WARRANTY

A. Provide five-year warranty against defects in materials and workmanship for the roof hatch.

1.4 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 System
   02 Roofing sheet metal
   03 Mechanical equipment
   04 Plumbing

PART 2 - PRODUCTS

2.1 PREFABRICATED ROOF CURBS

A. Curbs
   01 Walls. Galvanized steel
   02 Wood Nailers. Factory installed
   03 Insulation. 1-1/2 inch thick rigid fiberglass board
   04 Continuous mitered and welded corner seams.
   05 Interior sheet metal liner for exposed locations.

B. Counterflashing Cap. Galvanized steel

C. Pipe Flashing
   01 Pipe Seals: Neoprene or chlorinated polyethylene boot with stainless steel adjustable clamps
   02 Pipe Seal Base: Galvanized steel or spun aluminum

2.2 ROOF EXPANSION JOINT COVERS

A. Johns Manville Expand-O-Flash or comparable product by approved manufacturers listed.

B. EPDM sheet attached to sheet metal flanges with bifurcated crimp, with a closed cell polyethylene foam back.

2.3 ROOF HATCH

A. Unit: Single leaf type, similar to Bilco Type "S."

B. Integral Steel Curb: 14 gage galvanized steel with 1 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing, extended flange for mounting.

C. Flush Steel Cover: 14 gage galvanized steel; 1 inch glass fiber insulation; sandwiched by 22 gage steel interior liner; continuous neoprene gasket to provide weatherproof seal.

D. Hardware:
- 01 Compression spring operator and shock absorbers.
- 02 Steel manual pull handle for interior operation.
- 03 Steel hold open arm with vinyl covered grip handle for easy release.
- 04 Components cadmium plated finish.
- 05 Padlock hasp

E. Hinges: Heavy duty pintle type.

F. Safety Railing System:
- 01 Bilco "Bil-Guard" hatch railing system.
- 02 Meets OSHA fall protection regulations.

2.3 APPROVED MANUFACTURERS

A. Roof Curbs
- 01 Custom Curb, Inc.
- 02 The Pate Co.

B. Roof Expansion Joint Covers
- 01 Johns Manville
- 02 Tamko

C. Roof Hatches
- 01 Bilco Co.
- 02 Dur-Red Products
- 03 Milcor, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's printed instructions and approved shop drawings.

B. Coordinate with roofing operation for watertight integrity.

C. Finished installation shall be water and air tight. Install sealant conforming to FS TT-S-00227E, Type II, Class A.

END OF SECTION

SECTION 07 8116

SPRAYED FIREPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Cementitious fireproofing and supplementary items necessary for installation.

B. Use the listed U.L. Design numbers as required, to maintain the same hour rated assemblies. Provide additional fireproofing as required for each manufacturer used.

1.2 RELATED WORK:

A. Structural Steel Framing-Section 05 1200

B. Steel Joists Framing- Section 052100

C. Steek Decking- Section 05 3100

D. Intumescent Fireproofing- Section 07 8123

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Submit manufacturer's literature indicating U.L. Designs and minimum thickness for each steel member size shown on the drawings.

C. Certificate of Non-Contamination: The manufacturer shall submit an affidavit certifying that all materials are 100% asbestos free.

1.4 STORAGE AND HANDLING

A. Material Delivery: Deliver materials in original, unopened packages properly displaying name of manufacturer, U.L. Label, and appropriate labels for the application specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS/MATERIALS

A. Isolateck International:
   01 Standard Density: CAFCO 300
   02 Medium Density: CAFCO 400

B. W.R. Grace Construction Produts.
   01 Standard Density: Monokote MK-6
   02 Medium Density: Monokote Z-106HY

C. Carboline, Southwest Fireproffing
   01 Standard Density: Type 5GP
   02 Medium Density: Type 7 GP

D. The manufacturer providing the fire-proofing material must submit applicable UL designs specific in their product(s).

PART 3 - EXECUTION

3.1 LOCATION

A. Primary Structural Frames: 1 hour UL X790

B. Floor Construction & Associated Secondary Members: 1 hour UL G705

C. Roof Construction & Associated Secondary Members: 1 hour UL P922

E. Fireproofing is not required for structural members above 20 feet from finished floor.

3.2 PREPARATION

A. All surfaces to receive fire protections shall be free of oil, grease, loose mill scale, dirt, paints/primers or other foreign materials, which would impair satisfactory bonding to the surface.

B. Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by other trades prior to the application of spray-applied fire resistive materials. Cooridinate 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. Sprayed fire proofing shall not be applied to steel floor deck prior to the completion of concrete work on that deck.

F. Unsuitable substrate must be identified and made known to the General Contractor and corrected prior to application of he Sprayed Fireproofing.

3.3 APPLICATION

A. Apply sprayed fireproofing according to manufacturer’s written application instructions. Fireproofing at beams located 20 feet or more above floor and canopy columns and beams are not required.

B. Protection of other work: Protect other existing work from disfigurement and physical damage as a result of fireproofing application operations. Correct any damage resulting from this work.

C. Clean-up: Following the completion of each day's work, clean all surfaces not intended to receive fireproofing.

END OF SECTION

SECTION 07 8123

INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Intumescent fireproofing at exposed interior primary steel framing within 20' above nearest finish floor as required to meet designated fire ratings.

B. All steel framing members concealed behind wall and ceilings shall be fire proofed with cementitious sprayed fireproofing.

1.2 RELATED WORK:

A. Cementitious Fireproofing- Section 07 8116

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Submit manufacturer's literature indicating U.L. Designs and minimum thickness for each steel member size shown on the drawings.

C. Shop drawings: Submit shop drawings indicating locations of structural members to receive intumescent fireproofing.

D. Submit manufacturer's installation instructions and maintenance instructions.

E. Color/Finish Samples- submit samples/chips for decorative top coat representing manufacturer's full range of available colors and sheens for Owner/Architect's selection.

1.4 STORAGE AND HANDLING

A. Material Delivery: Deliver materials in original, unopened containers properly displaying name of manufacturer, U.L. Label, and appropriate labels for the application specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Isolotek

B. Carboline

C. W.R. Grace

D. Albi

E. Contego

2.2 MATERIALS

A. 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 E84:
a. Flame Spread Index: 25, maximum.
b. Smoke Developed Index: 50, maximum.

02 Hardness: 80 minimum when tested in accordance with ASTM D2240, Type D durometer.

B. Protective and Decorative Top Coat: As recommended by fireproofing manufacturer for exposure conditions.

01 Color and Gloss- Coordinate with paint specified in Section 099000 for color and sheen match as approved by Architect.

C. Primer: As required by tested and listed assemblies and as recommended by fireproofing, manufacturer to suit specific substrate conditions.

PART 3 – EXECUTION

3.1 APPLICATION

A. Thoroughly clean surfaces to receive fireproofing.

B. Repair substrates to remove surface imperfections that could, affect uniformity of texture and thickness of fireproofing.

C Apply fireproofing according to manufacturer’s written application instructions to required coating thickness.

D Clean-up: Following the completion of each day's work, clean all surfaces not intended to receive fireproofing.

END OF SECTION

SECTION 07 8413

FIRESTOPPING, PENETRATION SEALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Materials and labor required for installation of firestops around through - penetrations of pipe, duct, cable, cable tray, conduit, other electrical devices, blank openings and at the periphery of fire-rated walls, floors, partitions and floor/ceiling assemblies.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data
   01 Submit copies of manufacturer's specifications, recommendations, installation instructions, and maintenance data for each type of material required.
   02 Submit a copy of UL illustration of each proposed system indicating manufacturer approved modifications.

1.3 QUALITY ASSURANCE:

A. Standards
   01 ASTM E-814, Standard Method for Fire Tests of Through - Penetration Fire Stops.
   02 ASTM E-84, 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 E-814 or UL 1479 under a minimum positive pressure of 0.01 in. of water.

1.6 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 busways 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.

1.7 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.

1.8 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 MATERIALS

A. Firestopping, General

01 Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
02 Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and

approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

a. Permanent forming/damming/backing materials, including the following:
   01) Slag-/rock-wool-fiber insulation.
   02) Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   03) Fire-rated form board.
   04) Fillers for sealants.
b. Temporary forming materials.
c. Substrate primers.
d. Collars.
e. Steel sleeves.

B. Fill Materials

01 General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

02 Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

03 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

04 Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

05 Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

06 Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

07 Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

08 Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

09 Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

10 Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

11 Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
   b. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
   c. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

C. Mixing

01 For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds,

mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.2 MANUFACTURERS

A. A/D Fire Protection Systems Inc.

B. DAP Inc.

C. Firestop Systems Inc.

D. Hilti Construction Chemicals, Inc.

E. Instant Firestop Mfg. Inc.

F. International Protective Coatings Corp.

G. Isolatek International.

H. Nelson Firestop Products.

I. NUCO Industries.

J. RectorSeal Corporation (The).

K Specified Technologies Inc.

L. 3M Fire Protection Products.

M. Tremco.

N. United States Gypsum Company.

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 form 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 9200

BUILDING SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior sealants and sealants for mobbing joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of air and moisture.

B. Interior caulking where shown on the Drawings and between adjoining surfaces of dissimilar materials.

1.2 RELATED WORK

A. Sealants for Concrete walks and drives. Division 32

B. Glass Sealants. Division 8

C. Acoustical Sealants. Division 9

1.3 SUBMITTALS

A. Comply with Section 01 3300

B. Product Data. Manufacturer's specifications and installation instructions.

C. Samples.
   01 Samples or color charts showing manufacturer's full range of colors for each type of sealant.
   02 On site sample for Architect's approval.

1.4 REFERENCES

A. Federal Specifications TT-S-00227E
B. ASTM C793, ASTM C794

1.5 WARRANTIES

A. Warrant the work specified herein for two years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Caulking for Exposed Non-Working Interior Locations:
   01 Type: Paintable Acrylic Latex conforming to ASTM C834 vertical grade.

B. Sealant for All Working Joint and Exposed Exterior Locations:
   01 Type: Two part curing type, conforming to F.S. TT-S-00227E Class "A" Vertical Grade.

C. Primers, Cleaners, Top Coats: Use only materials listed as suitable in resistance to staining, compatibility and durability before proceeding.

D. Back-Up Filler: Closed cell or open cell, non-gassing filler as recommended by sealant manufacturer

E. Sprayed Foam Insulating Gap Filler:
   01. Low Pressure, one component, expanding, open-cell latex-based insulating foam gap filler.
   02. Class 1 Fire Retardant per ASTM E84.

2.2 ACCEPTABLE MANUFACTURERS

A. Sealants:
   01. Tremco
   02. Pecora, Inc.
   03. Sonneborn
   04. Mameco

B. Spayed Foam Insulating Gap Filler
   01. Convenience Products; Touch N Foam, Easy Fill Latex Foam Sealant.
   02. Dap Products Inc.;DAPtex Plus.

PART 3 - EXECUTION

3.1 APPLICATION

A. Temperatures: Do not install sealants when air temperature is under 40 degrees F. Sealants may be warmed to ease installation when recommended by the manufacturer.

B. Tooling: Tool exposed joints to a slightly concave surface using slicking materials recommended by the manufacturer. The tooling procedure shall press sealant against the sides of the groove. No materials shall be left "feathered" out or smeared on the abutting materials. If necessary, protect adjacent surfaces with tape. Completed joints shall have a uniform professional appearance. 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 1 1/2 times the compressed width. Lap ends 2" minimum.

F. Seal ends together in such a manner to allow natural drainage. Install filler by compressing material and sliding into joint. Align filler on one face of the joint before it expands to the full joint width.

F. Apply spayed foam insulating gap filler to gaps, cracks, cavities, openings and voids in exterior wall back-up, including annular space around piing, ducts, conduits, wiring and electrical outlets to seal off potential air drafts. Use professional hand-held dispensing gun in accordance with manufacturer's written instructions. After spayed foam sealant is applied, make flush with face of adjacent wall by using method recommended by manufacturer.

3.2 LOCATIONS

A. Install sealant and caulk at all joints as indicated on the Drawings or otherwise specified. Work shall include, but not be limited to the following:
   01 At both faces of exterior and interior metal frames
   02 At joints between metal casing beads for plaster and adjacent surfaces where joints are exposed to view.
   03 At exposed expansion joints and control joints in masonry.

04 At exterior door saddles for full length.
04 At all interior corner of ceramic wall tile. Between ceramic wall tile and door/window frames.
05 At close fitted space, between mechanical ducts, pipes and electrical conduit, and fire separation walls.
06 Where shown on the Drawings.
07 Between adjoining surfaces of dissimilar materials.
08 At edges of all metal flashings.

B. Apply spayed foam insulating gap filler within exterior wall assemblies to seal off all potential air drafts.

e

3.3 CLEANING

A. Clean surfaces soiled by work of this Section. Do not use chemicals, scrappers or other tools in cleaning which will damage surfaces. Make good other work cleaning has damaged under work of this Section.

END OF SECTION

SECTION 08 1110

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Hollow metal doors
B. Hollow metal frames and glazing frames.

1.4 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data
   01 Manufacturer's specifications and technical data.

C. Shop Drawing
   01 Show or schedule each door's location, size, thickness, details of construction, fire rating where applicable.

D. Finish Hardware Location
   01 Hollow metal manufacturer shall obtain an approved hardware schedule, hardware templates and samples of physical hardware where necessary to ensure correct fitting and installation.

1.5 QUALITY ASSURANCE

A. References
   01 National Fire Protection Association - NFPA Pamphlet No. 80
   02 American Society for Testing Materials:
      a. ASTM A526 - Steel sheet, zinc-coated (galvanized) by hot dip process, commercial quality
      b. ASTM A366 - Steel, carbon, cold-rolled sheet, commercial quality

   03 Underwriters Laboratories, Inc., in reference to fire-rated metal doors and frames.
   04 Factory Mutual, in reference to doors and frames.

   05 American National Standards Institute:
      a. ANSI A151-1-1969, Test Method for Standard Steel Doors
      b. ANSI A250.11-2001 Recommended Erection Instructions for Steel Frames

   06 NAAMM Hollow Metal Manufacturers Association

B. Delivery, Storage and Handling
   01 Deliver, store and handle hollow metal work in strict accordance with manufacture's recommendations to prevent damage, rust and deterioration. Store materials in a covered, dry location and promptly clean and touch-up scratches or rust spots with a rust-inhibitive primer.
   02 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Doors

01 Doors shall be custom made, of types and sizes shown on approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on faces or vertical edges. Minimum door thickness shall be 1 3/4 inches, unless specifically noted or shown differently.

02 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 gage of metal used. Provide 22 gauge steel stiffeners spaced max. 6 inch o.c. and extending full height of door. Fill interior with foamed in place urethane. Use mineral filler as required for labeled doors.

03 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.

04 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. Exterior doors shall have an additional flush closing channel at top and bottom edges. Openings shall be provided in the bottom closure channel at top and bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

05 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

06 Hardware Reinforcements:

a. Doors shall be mortised, reinforced, drilled and tapped at factory for fully templated hardware, in accord with the approved hardware schedule and template provided by Section 08710 - Finish 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:

01 Hinge & pivot reinforcements: 7 gauge

02 Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge

03 Reinforcements for lock face, flush bolts, concealed holders, concealed or surface-mounted closers: 12 gauge

07 Glass moldings and stops - Loose stops shall be not less than 18 gauge steel, with butt corner joints, secured to frame opening by countersunk tamper proof screws. Snap-on attachments will not be acceptable.

08 Gauges:

a. Exterior doors - 16 gauge A60 galvanized (zinc coated)

b. Interior doors - 18 gauge

09 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

B. Frames

01 Materials:

a. Frames for exterior openings shall be made of commercial cold rolled steel conforming to ASTM A366, not less than 14 gauge, and shall be galvanized (zinc coated).

b. Frames for interior openings shall be either commercial grade, cold-rolled steel conforming to ASTM A366 or commercial grade hot rolled and pickled steel conforming to ASTM A569. Metal thickness shall be not less than 16 gauge for frames openings, 4'-0" or less in width, and not less than 14 gauge for frames at openings over 4'-0" in width.

02 Design and Construction:

a. Frames shall be custom made, welded units with integral trim of sizes and shapes shown on approved shop drawings.

b. 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.

c. Jamb depths, trim, profile and backbends shall be as shown on approved shop drawings.

d. 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.
e. Minimum depth of stops shall be 5/8 inch.
f. 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.
g. Hardware Reinforcements:
01 Frames shall be mortised, reinforced, drilled and tapped at factory for fully templated mortised hardware in accordance with approved hardware schedule and templates provided by Section 08710 - Finish Hardware. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only.
02 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
h. Floor anchors shall be securely welded inside each jamb, with holes for floor anchorage.
i. Jamb Anchors:
01 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.
02 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 inches.
03 Frames to be anchored to previously placed concrete, masonry or structural steel shall be provided with anchors of suitable design as shown on approved shop drawings.
j. Dust cover boxes of not less than 26 gauge steel shall be provided at all mortised hardware items.
k. Frames shall be provided with steel spreader temporarily attached to bottoms of both jambs for bracing during shipping and handling.
l. Loose glazing stops shall be of cold rolled steel, not less than 18 gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium or zinc-plated screws. Loose stops at exterior frames shall be placed on the exterior side of the frames unless otherwise shown.
m. 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.

03 At hollow metal door frames 48” wide and wider, and interior windows 72” and wider, coordinate as required for installation of steel channel supports at jambs.

C. Finish
01 Shop paint steel (whether galvanized or ungalvanized) stops and accessories as follows:
a. Clean surfaces free of mill scale, rust, oil, grease, dirt and other foreign matter.
b. 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.

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. Provide metal applied label indicating rating designation at fire rated doors.

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.

E. Steel Louvers

01 Fabricate from 16 gauge and galvanized (zinc coated), inverted "V" blade, sight proof type, unless otherwise shown.

F. Jamb Extensions

01 Provide structural extensions at jambs as shown or required. Extensions are required for vertical members not otherwise adequately braced at top. Extension shall be C3 x 4.1 channel extending 12 inches into frame and welded. Weld to structure or provide 2" x 2" x ¼" steel angle headers installed in structure above to form rigid assembly.

G. Electrified Openings. Doors shall be pre-wired with sufficient number of concealed wires to accommodate electric function of specified hardware. Provide Molex type standardized plug in connectors to accommodate up to twelve wires.

2.2 MANUFACTURERS

A. Frames

01. CECO SU series
02. Curries M series
03. Steelcraft

B. Doors

01. CECO Legion or Medallion
02. Curries 707 or 747 series
0 03. Steelcraft L or B series

PART 3 - EXECUTION

3.1 INSTALLATION

A. Separate dissimilar metals, protect against galvanized action.

B. Frames

01 Anchorage and Connections. Firmly anchored and secure to adjacent construction.

02 Frame Spreader Bars. Leave intact until frames are set perfectly square and plumb and 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".

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”.

D. 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 1116

INTERIOR ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Interior aluminum door and glazing frames as shown or scheduled.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   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.
   02 Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   03 Manufacturer's installation instructions.

C. Samples of frame section with specified finish for Architect's approval.

1.3 REFERENCES

A. ASTM B221-Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
B. ASTM E152- Standard Methods of Fire Tests of Door Assemblies.
C. ASMA- AA-M C22A21 Clear Anodic Coating

1.4 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Manufacturers shall demonstrate previous experience in manufacturing of interior aluminum door and glazing framing for a period of not less than 10 years on comparable sized project.

1.5 WANRRANTY

A. Warrant against defects in manufacturing of materials for a period of two (2) years from date of substantial completion.

B. Warrant framing finish against defects, including cacking, flaking, blistering, peeling and excessive fading, chalking and non-uniformity in color for a period of five (5) years.

C. Warrant aluminum and glass doors for life of door against corer construction failure, causing wracking of door beyond acceptable tolerances.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Interior Aluminum Door Frames:
   01 Size: nominal 1-1/2” x 5-1/4” for 4-7/8” throat opening. Provide other widths to accommodate non-standard partitions.
   02 Frame Material:
      a. Aluminum: extrusions shall be 6063-T5 alloy and tempered per ASTM B221 alloy G.S. 10A-T5.
      b. Nominal thicknesses: .062 general; .130 at frame and hinge anchorage.
      c. Finish shall be clear anodic finish, AA-M12C22A21, etched, medium matte, clear anodic coating

03 Fasteners shall be aluminum, stainless steel or zinc plated steel in accordance with ASTM A 164-71. No exposed fasteners on finished installations.
03 Perimeter anchors shall be aluminum or steel in type and sizes as recommended by the manufacturer for the intended installation.
04 Continuous nylon backed wool pile sound and light seal at perimeter of door stop.
05 Glazing gaskets shall be vinyl; grey.

2.2 MANUFACTURERS

A. AlumaPro Frames

B. Frameworks-Type 1 Frame System

C. Raco Interior Office Fronts, Classic Series

D. Versatrac Frames

2.3 FABRICATION

A. Pre-machine jambs and prepare for hardware with concealed reinforcement plates, drilled and tapped as required, and fastened within frame with concealed screws.

B. Provide corner reinforcements and alignment clips for precise butt or mitered connections.

C. Fabricate all components to allow secure installation without exposed fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine project conditions and verify that the work of this section may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify wall thickness does not exceed standard tolerances allowed by specified frame throat size.

3.2 INSTALLATION

A. Comply with frame manufacturer’s printed installation instructions and approved shop drawings.

B. Install frames plumb and square, securely anchored to substrates with fasteners recommended by the manufacturer for long life under hard use.

C. Provide protection required to assure that frames with be without damage or deterioration resulting from other work.

END OF SECTION

SECTION 08 2113

PLASTIC LAMINATE FACED WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Plastic Laminate Faced Wood Doors and supplementary items necessary for installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's specifications and installation instructions.

C. Shop Drawings. 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.

D. Samples. Plastic laminate colors and patterns for Architect's selection.

1.3 REFERENCES

A. Underwriters Laboratories
   01 UL B Label Fire Door

B. National Fire Protection Association
   01 NFPA Pamphlet No. 80 "Fire Doors and Windows"

C. Architectural Woodwork Institute

PART 2 – PRODUCTS

2.1 MATERIALS

A. Interior Wood Doors with Plastic Laminate Cladding
   01 Thickness: 1 3/4"
   02 Core
      a. Material: Particle Board Core
      b. Density: 28-32 lb./cu.ft
      c. Comply with Commercial Standard CS-236 and AWI
   03 Stile: 1-3/8" maple, birch or poplar
   04 Rail: 1-3/8" maple, birch or poplar
   05 Plastic Laminate: 1/16" thick
   06 Color: Selected by Architects from manufacturer's standards.
   07 Glass Stops: All glass stops shall be flush type field paint in color selected by Architect.
   08 Seal top, bottom and cut surface of openings at factory with two coats of varnish.
   09 Vertical door edges shall be factory painted to match door face. Factory shall supply matching paint and edges shall be touched up in field.

2.2 MANUFACTURERS

A. Doors

   01 Buell Door Co..
   02 Marshfield Door Systems, Inc.

03 Vauter Door Co.
04 VT Industries, Inc.

B. Plastic Laminate

01 Enjay Fibers and Laminates Co., "Nevamar"
02 Formica Corp., "Formica"
03 General Electric "Textolite"
04 Pionite
05 Ralph Wilson Plastics, "Wilsonart"
06 Westinghouse Electric Co., "Micarta"

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
01 Verify that tops and bottoms of doors have been sealed prior to installation.
02 Fit accurately in frames, within following clearances for all doors:
a. Jambs and Head: 1/8” maximum.
b. Between Edges of Parts of Doors: 1/8” maximum.
c. Between Bottom of Door and Top of Threshold: 3/8” maximum.
d. Between Bottom of Door and Top of Floor (No Threshold): ¾” maximum.
03 Adjust, rehang or replace doors that do not operate properly.

B. Interior Fire Rated Wood Doors installed where scheduled.
01 Conform to NFPA Pamphlet No. 80 “Fire Doors and Windows.”

END OF SECTION

SECTION 08 3313

COILING COUNTER DOOR

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Non-rated coiling counter door at Food Service Dish Washer.

1.2 RELATED WORK

A. Overhead coiling doors. Section 08 3323.

1.3 SUBMITTALS

A. Comply with Section 01300.

B. Product Data: Manufacturer's specification and technical data.

C. Shop drawings: Indicate size, material, and finish. Show location and installation procedures. Include details of joints, attachments and clearances.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Curtain
   a. Stainless Steel, 22 gauge minimum.
   b. Slats: Flat, 1-1/4” wide x 1/2” deep

B. Guides: Stainless steel shapes

C. Barrel: 4 inch minimum diameter steel tubing

D. Counter Balance: Oil-tempered torsion springs with grease sealed ball bearings.

E. Hood: Stainless steel hood of 24 gauge minimum, grade 304 or better at B118B

F. Finish: No. 4 satin finish

G. With integral stainless-steel frame and sill.

H. Sliding latch bolts and cylinder lock, one at each jamb, to be operated from the inside of the door.

2.2 MANUFACTURERS

A. Atlas Door Corp.

B. Cookson Co.

C. Overhead Door Corp.

D. North American Rolling Door, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install at locations shown on the drawings.

B. Follow manufacturer's printed instructions.

C. Provide all miscellaneous angles, brackets and supports for a complete installation.

END OF SECTION

SECTION 08 3323

OVERHEAD COILING DOORS

PART 1 – GENERAL

1.1 THIS SECTION INCLUDES:

A. Aluminum Overhead Coiling Door.

1.2 RELATED WORK

A. Cylinders for locks. Section 08 7100

B. Coiling Counter Door. Section 08 3313

C. Electrical wiring, conduit, connections to power supply and disconnect switch. Division 26

D. Installation of Control Station. Division 26.

1.4 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop drawings and product data. Indicating size, material, finish, joints, attachments, and clearances.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Doors:
- 01 Slat design shall be 0.050 inch (1.270mm) aluminum, low profile, 2 5/8" high x 7/8" deep. Clear anodized aluminum finish.
- 02 Interlocking section with high strength nylon endlocks on alternate slats.
- 03 Barrel: Steel pipe, sized to deflect a max. of 0.30 inches per foot span under load.
- 04 Brackets: Minimum 5/16 inch steel plate or 3/8 inch cast iron. Attach brackets to side guides so weight is distributed along door jambs.
- 05 Guides: Galvanized structural steel angles 3/16 inch minimum thickness, with grooves to retain curtain under specified load. Provide continuous galvanized wall angle with device to remove curtain without removing guides.
- 06 Bottom Bar: Provide two aluminum angles 1-1/2" x 2" x 1/8". Finish to match door slats.
- 07 Locking Device: Provide Cylinder lock (less Cylinder) with interlocking switch.
- 08 Operation: Motor operated. Supply Industrial duty, UL listed gearhead hoist type operator, 115v, single phase, HP as recommended by manufacturer. Provide UL listed electric door operator assembly capable of driving the door at a speed of 8 to 9 inches per second. Complete with flush-mount control station with open/close/stop push buttons, NEMA 1. Provide automatic stop control by an automatic sensing switch extending full width of door bottom bar.

2.2 MANUFACTURERS

A. Atlas Door Corp.
B. Cookson Co.
C. Overhead Door Co.
D. North American Door Corporation
E. Cornell Iron Works, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in strict accordance with manufacturer's printed instructions at locations shown on drawings.

B. Adjust operation so that doors close completely, operate freely, and maintain a secure closing.

END OF SECTION

SECTION 08 4400

GLAZED ALUMINUM FRAMING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Glazed aluminum storefront systems.
B. Storefront framing for punched openings
C. Outrigger Sunshade
D. Curtain wall systems
E. Aluminum entrance doors
F. Pass Window

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   01 Complete shop drawings by manufacturer, indicating elevations, sections, substrates, finishes, hardware, location, size and attachment of all framing proposed to be installed. Drawings shall bear the seal of a Registered Professional Engineer, Licensed in the State of Texas.
   02 Manufacturer's specifications and other data needed to prove compliance with specified requirements, and manufacturer's installation instructions.
   03 Provide Engineers calculations to supplement the general design. Calculations shall bear the seal of a Registered Professional Engineer, Licensed in the State of Texas.

B. 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 manufacturers full color line.
   03 Obtain hardware templates from finish hardware supplier.
   04 Samples of framing finish for approval and fastener types.

1.4 REFERENCES

A. American National Standards Institute:
   ANSI 297.1 - 1975 Safety Performance Specification
   ANSI 297.1 - 1972 Safety Glass Code

B. Federal Specifications:
   Fed. Spec. DD-G-001403 B
   Fed. Spec. TT-S-00230 Sealing Compound: Synthetic Rubber Base and TT-S-00203C
   Fed. Spec. TT-S-001657 Sealing Compound: Butyl Rubber Base
   Fed. Spec. DD-G-451d

C. AAMA HS-A2

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs 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. 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

C. Accessible Entrance for Aluminum Entrance Doors: Comply with applicable provisions in the US Architectural & Transportation Barriers compliance Boards' ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.7 WARRANTY

A. Provide a two year, full system manufacturer's warranty.

PART 2 - PRODUCTS

2.1 MANUFCATURERS AND PRODUCTS

A. Manufacturers:
   01 Old castle Building Envelope
   02 US Aluminum Coorp.
   03 YKK AP America Inc.

B. Basis of Design: Contract Documents are based on products and systems specified to establish a standard of quality. Other manufacturers offering products having equivalent characteristics may be considered, provided deviations are minor and comply with requirements of Contract Documents as judged by the Architect.
   01 Storefront System: Kawneer Tri-Fab 451(2" x4 ½")
   02 Curtain Wall System: Kawneer 1600 (2 ½" x 7 1/2")
   03 Aluminum Entrance Door System: Heavy duty, wide stile Kawneer 500 Tuffline Entrances.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation or other defects in construction.
   01 Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long–term creep and deflection from uniformly distributed and concentrated live loads.
   02 Failure also including the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal structural movements.
      d. Loosening or weakening of fasteners, attachments and other components.

C. Structural Loads:

01 Wind Loads for Exterior Systems: Determine positive and negative wind pressures according to ASCE-SEI 7 using wind speed criteria indicated on Structural Drawings.
02 Lateral Loads for Interior Systems: Uniform lateral load of 5 psf.

D. Deflection of Framing Members: At design wind pressure, as follows:
01 Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite of an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
02 Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

E. Structural: Test according to ASTM E330 as follows:
01. When tested at positive and negative wind-load design pressures assemblies do not evidence deflection exceeding specified limits.
02. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
03. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
01. Fixed Framing and Glass Area:
a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air=pressure differential of 6.24 lbs/sq. ft.
02. Entrance Doors:
a. Pair of Doors: Maximum air leakage of 1.0 cfm/sf at a static-air-pressure differential of 1.57 lbf/sq, ft.
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
01. No evidence of water penetration through fixed glassing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbs/sq. ft.

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
01. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbs/sq. ft.
02. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Energy Performance: Certify and label energy performance according to NFRC as follows:
01. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 BTU/sq. ft. x h x deg F as determined according to NFRC 100.
02. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.25 as determined according to NFRC 200.

J. Thermal Movement: Allow for thermal movements resulting from ambient and surface temperature changes:
01. Temperature Change: 120 deg F, ambient, 180 deg F, material surfaces.

02. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 18o deg F.
    b. Low Exterior Ambient-Air Temperature: 0 deg F.
    c. Interior Ambient-Air Temperature: 75 deg F.

2.3 FRAMING SYSTEM

A. Framing Members: Manufacturer's extruded or formed aluminum framing members of thickness required and reinforced as required to support imposed loads.
    01. Construction:
        a. Exterior Systems: Thermally broken.
        b. Interior Systems: Nonthermally broken.
    03. Glazing System: Retained mechanically with gaskets on four sides.
    04. Glazing Plane: As indicated.
    05. Finish: Clear Anodized Aluminum.
    06. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements; Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:
    01. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
        a. Sheet and Plate: ASTM B209.
        b. Extruded Bars, Rods, Profiles and Tubes: ASTM B221.
        c. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
        d. Structural Profiles: ASTM B 308/B 308M.
    02. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
        a. Structural Shapes, Pleases and Bars: ASTM A36/A36M.
        b. Cold-Rolled Sheet and Strip: ASTM A 1008/A1008M.
        c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTMES

A. Aluminum and Glass Entrance Doors: Heavy duty manual swing operation entrance door system designed to coordinate with glazed aluminum wall framing system. Equal to Kawneer 500 Tuffline Entrance Doors.
    01 Door Construction: 2 inch overall thickness, with minimum 0.188 inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded.
    02 Door Design: Wide stile; 5 inch vertical stile, 5 inch top rail, 10 inch bottom rail and 8 inch intermediate rail.
    03 Glazing Stops and Gaskets: Square, snap-on extruded-aluminum stops and preformed gaskets.
        a. Provide non-removable glazing stops on outside of door.
    04. Door Hardware:

a. Thresholds: BHMA A156.21, raised threshold with a slope of not more than 1:2 with maximum height of ½ inch. Provide cutouts coordinated for operating hardware, with anchors and jamb clips.
b. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
c. Balance of Door Hardware: As specified in Division 08 Section " Door Hardware".

03 Finish: Clear Anodized Aluminum.

2.5 OUTRIGGER SUNSHADE

A. Equal to Kwaneer "Versoleil" Sunshade Outrigger System
B. 30" deep with Airfoil blades.
C. Finish: Clear Anodized Aluminum

2.6 PASS WINDOW

A. Equal to Quikserv SC series sliding window.
B. Factory glazed with ¼" tempered glass.
C. Self-closing with heavy duty security lock with thumb turm.
D. Finish: clear anodized aluminum
E. Size: 46" W x 36" H.

2.7 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing".
B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks and shims or spacers.
C. Glazing Sealants: As recommended by manufacturer.

2.8 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
   01. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads or vibration.
   02. Reinforce members as required to receive fastener threads.
   03. Use exposed fasteners with countersunk phillips screw heads, fabricated from 300 series stainless steel.
B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A240/A 240M of type recommended by manufacturer.
D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.
B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
C. Fabricate components that, when assembled, have the following characteristics:

01. Profiles that are sharp, straight and free of defects or deformations.
02. Accurately fitted joints with ends coped or mitered.
03. Physical and thermal isolation of glazing from framing members.
04. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
05. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
06. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
01. At exterior doors, provide compression weather stripping at fixed stops.
02. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
01. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
02. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. 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

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. Install curtain wall units plumb, square, and level and in proper relationship and alignment with other curtain wall units and adjacent work.

H. Caulk joints where indicated to meet performance specifications using materials specified in Sealants - Section 07900. Follow sealant manufacturer's printed instructions for the installation of his product.

I. 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. 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 PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass, except as specifically directed by the Architect.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and hollow metal doors herein.

B. Hardware for aluminum doors unless otherwise specified.

C. Hardware for other doors indicated.

D. Keyed cylinders as indicated.

1.02 RELATED SECTIONS:

A. Section 06 1000- Rough Carpentry

B. Section 08 1110 - Hollow Metal Doors and Frames.

C. Section 08 4400 - Aluminum Doors and Frames.

D. Section 08 2113 - Flush Wood Doors.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

C. BHMA A156.1 - Standard for Butts and Hinges; 2021.

D. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

E. BHMA A156.3 - Exit Devices; 2020.

F. BHMA A156.4 - Door Controls - Closers; 2019.

G. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

H. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

I. BHMA A156.7 - Template Hinge Dimensions; 2016.

J. BHMA A156.16 - Auxiliary Hardware; 2018.

K. BHMA A156.21 - Thresholds; 2019.

L. BHMA A156.22 - Standard for Gasketing; 2021.

M. BHMA A156.26 - Standard for Continuous Hinges; 2021.

N. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2018.

O. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

P. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

Q. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

R. DHI (KSN) - Keying Systems and Nomenclature; 2019.

S. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

T. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

U. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

V. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

W. ITS (DIR) - Directory of Listed Products; Current Edition.

X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Y. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

BB. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

CC. UL 437 - Standard for Key Locks; Current Edition, Including All Revisions.

DD. UL 1037 - Antitheft Alarms and Devices; Current Edition, Including All Revisions.

EE. UL 1610 - Central-Station Burglar-Alarm Units; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.
      b. Owner.
      c. Door Hardware Installer.
      d. Owner's Security Consultant.
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
      a. Key control system requirements.
   5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
      a. Submit in vertical format.
   3. Include complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
   1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
   2. Submit one (1) sample of hinge, lockset, and closer illustrating style, color, and finish.
   3. Include product description with samples.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

K. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.

3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Closers:
1. Provide door closer on each exterior door, unless otherwise indicated.
2. Provide door closer on each fire-rated and smoke-rated door.
3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

D. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.

E. Weatherstripping and Gasketing:

F. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
   a. Aluminum fasteners are not permitted.
   b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
   a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
   a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
   b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
5. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
6. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
1. BEST; dormakaba Group: www.bestaccess.com/#sle.
2. Hager; Hager Companies: https://www.hagerco.com/home.
3. McKinney; Assa Abloy: https://www.mckinneyhinge.com/en.
4. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html

5. Substitutions: Not permitted.

B. Properties:
   1. Butt Hinges: As applicable to each item specified.
      a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
      b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
      c. Template screw hole locations.
      d. Bearing assembly installed after plating.
      e. Bearings: Exposed fully hardened bearings.
      f. Bearing Shells: Shapes consistent with barrels.
      g. Pins: Easily seated, non-rising pins.
         1) Fully plate hinge pins.
         2) Non-Removable Pins: Slotted stainless steel screws.
      h. UL 10C listed for fire-resistance-rated doors.
   2. Continuous Hinges: As applicable to each item specified.
      a. Geared Continuous Hinges: As applicable to each item specified.
         1) Non-handed.
         2) Anti-spinning through-fastener.
         3) UL 10C listed for fire-resistance-rated doors.
            (a) Metal Door Installation: Rated up to 90 minutes.
            (b) Wood Door Installation: Rated up to 60 minutes.
         4) Sufficient size to permit door to swing 180 degrees

C. Sizes: See Door Hardware Schedule.
   1. Hinge Widths: As required to clear surrounding trim.
   2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
   1. Fully polish hinges; front, back, and barrel.

E. Grades:
   1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:
   1. Butt Hinges: Include full mortise hinges.
   2. Continuous Hinges: Include geared hinges.

H. Quantities:
   1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
      a. Hinge weight and size unless otherwise indicated in hardware sets:
         1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
         2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
         3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
         4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
   2. Continuous Hinges: One per door leaf.

I. Applications: At swinging doors.
   1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

J. Products:
   1. Butt Hinges:

a. Ball Bearing, Five (5) Knuckle.
2. Continuous Hinges:
a. Aluminum geared hinges.

2.04 BOLTS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
3. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
4. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Flush Bolts:
a. Automatic Flush Bolts: Automatically latching upon closing of door leaf.
1) Bolt Throw: 3/4 inch (19 mm), minimum.
2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.

C. Options:
1. Lever extensions: Provide for top bolt at oversized doors.

D. Products:
1. Automatic flush bolts.

2.05 EXIT DEVICES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.Corbin Russwin; Assa Abloy: https://www.corbinrusswin.com/
2. Von Duprin; Allegion PLC:https://www.vonduprin.com/en/index.html.
3. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
1. Actuation: Full-length touchpad.
2. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
4. Lever Design: Match project standard lockset trims.
5. Cylinder: Include where cylinder dogging or locking trim is indicated.
6. Strike as recommended by manufacturer for application indicated.
7. Sound dampening on touch bar.
8. Dogging:
a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch (6 mm).
b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.
10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
11. Handing: Field-reversible.
12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

C. Grades: Complying with BHMA A156.3, Grade 1.
1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

2.06 LOCK CYLINDERS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties:
1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
a. Provide cylinders from same manufacturer as locking device.
b. Provide cams and/or tailpieces as required for locking devices.

c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:

E. Types: As applicable to each item specified.
1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1CM-7 cores.

F. Applications: At locations indicated in hardware sets, and as follows
1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products:
1. Rim/mortise.

2.07 MORTISE LOCKS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties:
1. Mechanical Locks: Manufacturer's standard.
a. Fitting modified ANSI A115.1 door preparation.
b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
e. Backset: 2-3/4 inch (70 mm).
f. Lever Trim:
1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
3) Spindle: Designed to prevent forced entry from attacking of lever.
4) Independent spring mechanism for each lever.
(a) Trim to be self-aligning and thru-bolted.
5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
6) Levers to operate a roller bearing spindle hub mechanism.

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades:

E. Options:
1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.

F. Products: Mortise locks, including standard and electrified types.
1. 40H.

2.08 CYLINDRICAL LOCKS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties:
1. Mechanical Locks:

a. Fitting modified ANSI A115.2 door preparation.
b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
    1) Through-bolted anti-rotational studs.
d. Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
e. Bored Hole: 2-1/8 inch (54 mm) diameter.
f. Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
g. Latch: Single piece tail-piece construction.
    1) Latchbolt Throw: 9/16 inch (14.3 mm), minimum.
h. Cylinders:
    1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
        (a) Small format interchangeable.
i. Lever Trim:
    1) Style: See Door Hardware Schedule.
    2) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
    3) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
    4) Independent spring mechanism for each lever.
        (a) Contain lever springs in the main lock hub.
    5) Outside Lever Sleeve: Seamless one-piece construction.
    6) Keyed Levers: Removable only after core is removed by authorized control key.

C. Finishes: See Door Hardware Schedule.
    1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty .
    1. Durability: Passing 50 Million cycle tests verified by third party testing agency.

E. Material: Manufacturer's standard for specified lock.
    1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
    2. Outside Lever Sleeve: Hardened steel alloy.

F. Options:

G. Products: Cylindrical locks, including mechanical and electrified types.
    1. 9K (Grade 1).

2.09 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
    1. Trimco: www.trimcohardware.com/#sle.
    2. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
    3. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
    4. Substitutions: Not permitted.

B. Properties:
    1. Pull Type: Straight, unless otherwise indicated.
    2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
        a. Edges: Beveled, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

E. Products:
    1. Push-Pull Plates.

2.10 COORDINATORS

A. Manufacturers:
    1. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html

2. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
3. Substitutions: Not permitted.

B. Properties:
1. General: Non-handed devices, with field-selectable active door leaf.

C. Grades:

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
1. Meet UL 10C for Positive Pressure.

E. Types:

F. Installation:
1. Mounting: Provide necessary mounting brackets and filler bars to ensure proper installation of coordinator and related hardware.
2. Coordination: Properly sequence installation of other door hardware affected by placement of coordinators and carry bars.

2.11 CLOSERS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. dormakaba, dormakaba Group: https://www.dormakaba.com/
3. Sargent; Assa Abloy: https://www.sargentlock.com
4. LCN; Allegion PLC: https://www.lcnclosers.com/en/index.html.
5. Substitutions: Not permitted.

B. Properties:

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
(a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Types:
1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

E. Options:
1. Advanced backcheck.

F. Installation:
1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At outswinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

2.12 PROTECTION PLATES

A. Manufacturers:
1. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
2. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
3. Substitutions: Not permitted.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
b. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.

E. Installation:
1. Fasteners: Countersunk screw fasteners

2.13 STOPS AND HOLDERS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. Rockwood; Assa Abloy: https://www.rockwoodmfg.com/en.
3. Ives; Allegion PLC: https://us.allegion.com/en/products/brands/ives.html.
4. Substitutions: Not permitted.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
1. Wall Bumpers: Bumper, concave, wall stop.
2. Floor Stops: Provide with bumper floor stop.

F. Installation:
1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

G. Products:
1. Wall Bumpers.
2. Floor Stops.

2.14 THRESHOLDS

A. Manufacturers:
1. National Guard Products, Inc: www.ngpinc.com/#sle.
2. Pemko; Assa Abloy: https://www.pemko.com/en/products/gasketing/perimeter-gaskets.
3. Substitutions: Not permitted.

B. Properties:
1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.

2.15 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
1. National Guard Products, Inc: www.ngpinc.com/#sle.
2. Pemko; Assa Abloy: https://www.pemko.com/en/products/gasketing/perimeter-gaskets.
3. Substitutions: Not permitted.

B. Properties:
1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

C. Grades: Comply with BHMA A156.22.

D. Products:
1. Weatherstripping: See Door Hardware Schedule.
2. Door Bottom Seals:
a. Door Sweeps: See Door Hardware Schedule.

2.16 KEYS AND CORES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.
   1. Provide small format interchangeable core.
   2. Provide Patented CORMAX keys and cores.
   3. Provide keying information in compliance with DHI (KSN) standards.
   4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
   5. Keying: Master keyed.
   6. Include construction keying and control keying with removable core cylinders.
   7. Supply keys in following quantities:
      a. Master Keys: 4 each.
      b. Construction Master Keys: 6 each.
      c. Construction Keys: 15 each.
      d. Construction Control Keys: 2 each.
      e. Control Keys if New System: 2 each.
   8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
   10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
   11. **Owner to install all permanent cores** and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
   1. Patented:
      a. CORMAX.

2.17 KEY CABINETS

A. Manufacturers:
   1. Lund Equipment Company, Inc: www.lundkey.com/#sle.
   2. Telkee: www.telkee.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
   2. Security Key Tags: For each keyed lock on project, provide one set of matching key tags for permanent attachment to one key of each set.
   3. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
   4. Mounting: Wall surface mounted.
   5. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
   6. Key cabinet lock to facility's keying system.

C. Finishes: Baked enamel, manufacturer's standard color.

D. Material: Sheet steel.

E. Products:
   1. Lund.
   2. Telkee.

2.18 FIRE DEPARTMENT LOCK-BOXES

A. Manufacturers:
   1. Knox Company; Knox-Box Rapid Entry System www.knoxbox.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Properties:
   1. Heavy-duty, recessed, solid steel box with hinged door and interior gasket seal; single drill-resistant lock with dust covers and tamper alarm.
   2. Capacity: Holds 10 keys.
   3. Construction complying with UL 1037, UL 1610, and UL 437.

C. Locations:
   1. **One recessed unit at main entrance.**
   2. **Two surface mounted units at locations directed by COH**

D. Finishes: Manufacturer's standard coating.
   1. Color: Manufacturer's standard dark bronze.

E. Options:. As applicable to each item specified.

F. Products:
   1. Knox.

2.19 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer's fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Steel Door Frames: See Section 081213.
   3. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
   4. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   5. Flush Wood Doors: See Section 081416.
   6. Stile and Rail Wood Doors: See Section 081433.
   7. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch (1024 mm).
      b. Push Plates/Pull Bars: 42 inch (1067 mm).
      c. Deadlocks (Deadbolts): 48 inch (1219 mm).
      d. Exit Devices: 40-5/16 inch (1024 mm).
      e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.07 DOOR HARDWARE

Manufacturer list

BES	Best
PRE	BEST (Precision)
NGP	National Guard Products
SEL	SELECT
TRI	Trimco

Option list

Code:	Name:
S	Single Keyed Classroom
RQE	Request to Exit
PC90	PC90 Full Size Plastic
D	Storeroom
AVB	AVB Advanced Variable Backchk
3	2-3/4" Backset
B4E Heavy	Heavy Bevel Edges
Mullion	Provide at the mullion
AB	Entrance
VIBE	Double Visual Indicator
PATD	Patented keyed core
V4908	Key controls lever
R	Classroom
2	Standard Length
10"	Height
7	7 Pin
X 2" LDW	Width
EPT	Electric Power Transfer Prep
MLR	Motorized Latch Retraction
4" ODW	4" Over Door Width
C	Pre-Terminated Quick Connect Plug
4	Standard Mortise
WTS	Weatherized Touchbar Monitoring Switch
L	Privacy Function
PATD	Patented
CD	Cylinder Dogging: 1-1/4" Mortise Cylinder not included
N	Passage
Head & Jambs (2)	Provide at the head and both jambs

0	Keyless
LM	Lost Motion
LAR	Length As Required
NRP	NON-REMOVABLE PINS
CSK	Counter Sunk Holes
DEU	Electrically Unlocked

Finish list

Code:	Name:
B	Brown
689	Aluminum
32D	Satin stainless steel
CL	Clear
626W	Weatherized Satin Chrome
630	Satin stainless steel
626	Satin chromium plated
A	Anodized Aluminum
26D	Satin chromium plated

Hardware Sets

Set #101

Doors: C139B

6.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Keyed Removeable Mullion	KR822	689	PRE
2.0	Exit Device	2108 CD D V4908	630	PRE
3.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Mortise Cylinder	1E 7 4 PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Gasketing	5100N Mullion		NGP
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #102

Doors: A106, A123, B101A, B104B, C101A, C112, C121, C139A, C140, A131

2.0	Continuous Hinge	SL27 EPT	CL	SEL
2.0	Power Transfer	EPT-12C		PRE
1.0	Keyed Removeable Mullion	KR822	689	PRE
1.0	Exit Device	2103 C MLR WTS CA-03	626W	PRE
1.0	Exit Device	2102 C WTS	626W	PRE
1.0	Pull	1097 PHI	630	TRI
2.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Threshold	8425 LAR	A	NGP
2.0	Sweep	200S LAR	A	NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Gasketing	5100N Mullion		NGP
1.0	Drip Cap	16 4" ODW	A	NGP
1.0	Card Reader	BY SECURITY CONTRACTOR		
1.0	Power Supply	BY SECURITY CONTRACTOR		
2.0	Door Position Switch	BY SECURITY CONTRACTOR		
2.0	Wiring Harness	WH-12P		BES
2.0	Wiring Harness	WH-192P		BES
2.0	Wiring Harness	WH-6E		BES

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RETRACKS LATCH AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. WTS SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #102.1

Doors: C101B, C101D

2.0	Continuous Hinge	SL27	CL	SEL
1.0	Keyed Removeable Mullion	KR822	689	PRE
1.0	Exit Device	2103 CA-03	626W	PRE
1.0	Exit Device	2102	626W	PRE

1.0	Pull	1097 PHI	630	TRI
2.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Threshold	8425 LAR	A	NGP
2.0	Sweep	200S LAR	A	NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Gasketing	5100N Mullion		NGP
1.0	Drip Cap	16 4" ODW	A	NGP

Set #103

Doors: B104A

6.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Keyed Removeable Mullion	KR822	689	PRE
2.0	Exit Device	2108 CD D V4908	630	PRE
3.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Mortise Cylinder	1E 7 4 PATD	626	BES
2.0	Door Closer	EHD90 16 AF90P	689	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Gasketing	5100N Mullion		NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		

Set #104

Doors: B125A

6.0	Hinge	FBB191 NRP 45X45	32D	BES
1.0	Keyed Removeable Mullion	KR822	689	PRE
2.0	Exit Device	2103 CD CA-03	630	PRE
3.0	Rim Cylinder	12E 7 2 PATD	626	BES
2.0	Mortise Cylinder	1E 7 4 PATD	626	BES
2.0	Pull	1097 PHI	630	TRI
2.0	Door Closer	EHD90 16 SDS90	689	BES
2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Threshold	8425 LAR	A	NGP
2.0	Sweep	200S LAR	A	NGP
1.0	Gasketing	700S Head & Jambs (2)	A	NGP
1.0	Gasketing	5100N Mullion		NGP
1.0	Drip Cap	16 4" ODW	A	NGP

Set #105

Doors: C133

6.0	Hinge	FBB168 NRP 5X45	26D	BES
1.0	Flush Bolt	3820x3810	626	TRI
1.0	Strike	3910	626	TRI
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
2.0	Door Closer	EHD90 16 SDS90	689	BES

2.0	Kick Plate	K0050 10" X 1" LDW CSK B4E	630	TRI
1.0	Coordinator	3090 SERIES	626	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #106

Doors: B137

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Mortise Lock	45H 0 L 14 H VIBE	630	BES
1.0	Deadbolt	8T 3 S PATD 7	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #107

Doors: C128A, C128B

3.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Exit Device	2108 CD D V4908	630	PRE
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Mortise Cylinder	1E 7 4 PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Dome Stop	1211	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #108

Doors: A218

3.0	Hinge	FBB168 NRP 5X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #109

Doors: B130, B141, B148, B149, B118, B155, C123B, C123A

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Privacy Mortise Lock	45H 0 L 14 H VIBE	630	BES
1.0	Deadbolt	8T 3 S PATD 7	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #110

Doors: B128, C135, B154

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 AB 14 C LM PATD	626	BES
1.0	Dome Stop	1211	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #111

Doors: B126A

3.0	Hinge	FBB191 NRP 45X45	32D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
2.0	Sweep	200S LAR	A	NGP
1.0	Gasketing	700S Head & Jambs (2)	A	NGP
1.0	Threshold	8425 LAR	A	NGP
1.0	Drip Cap	16 4" ODW	A	NGP

Set #112

Doors: A120, B112, B123, B124, B125B, B126B, C130, C132

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

NOTE: USE 5” x 4.5” HINGES AT 4’ DOORS.

Set #113

Doors: A224, B127, B134

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #114

Doors: C128C

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 R 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI

1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #114.1

Doors: B129

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Push Plate	1001-3	630	TRI
1.0	Pull Plate	1018-3B	630	TRI
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #115

Doors: C131

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Power Transfer	EPT-12C		PRE
1.0	Electromechanical Cylindrical Lock	9KW 3 7 DEU 14 C LM RQE PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing NGP	5050 Head & Jambs (2)	B	
1.0	Wiring Harness	WH-6E		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Wiring Harness	WH-12P		BES
1.0	Power Supply	BY SECURITY CONTRACTOR		
1.0	Door Position Switch	BY SECURITY CONTRACTOR		
1.0	Card Reader	BY SECURITY CONTRACTOR		

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RELEASES LEVER AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. RQE SWITCH IN LEVERSET TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #116

Doors: B131, C201

3.0	Hinge	FBB191 NRP 5X45	32D	BES
1.0	Power Transfer	EPT-12C		PRE
1.0	Exit Device	2103 C MLR WTS CA-03	626W	PRE
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Pull	1097 PHI	630	TRI
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Threshold	8425 LAR	A	NGP
1.0	Drip Cap	16 4" ODW	A	NGP
1.0	Sweep	200S LAR	A	NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		

1.0	Door Viewer	976U	626	TRI
1.0	Wiring Harness	WH-12P		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Wiring Harness	WH-6E		BES
1.0	Power Supply	BY SECURITY CONTRACTOR		
1.0	Door Position Switch	BY SECURITY CONTRACTOR		
1.0	Card Reader	BY SECURITY CONTRACTOR		

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RETRACKS LATCH AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. WTS SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #117

Doors: C107A, C107B, C110A, C110B, C114A, C114B, C117A, C117B, C124B, C124A, C120

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 0 N 14 C LM	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Dome Stop	1211	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #118

Doors: B111A, B111B

3.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 R 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #119

Doors: A101, A102, A103, A104, A105, A107, A108, A112, A113, A114, A116, A117, A124, A127, A130, A132, A133, A134, A135, A201, A203, A204, A205, A206, A208, A209, A210A, A210B, A212, A216, A217, A220, A230, A231, A232, A233, A234, A235, A236, A237, A238, A239, A240, B102A, B102B, B107, B109A, B113A, B122, B132A, B132B, B138A, B138B, B143, B144, B145, B146, C103, C122, C126A

3.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 R 14 C LM PATD	626	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #120

Doors: A118, B103A, B103B, B119, B156

3.0	Hinge	FBB179 NRP 45X45	26D	BES

1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP

Set #121

Doors: A122, A225, A227, B123A, C129

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Mortise Lock	45H 7 H 14 H VIBE	630	BES
1.0	Deadbolt	8T 3 S PATD 7	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Dome Stop	1211	630	TRI

Set #122

Doors: B110A, B110B

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 0 N 14 C	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		

Set #123

Doors: B140, C126B

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 0 N 14 C	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Dome Stop	1211	630	TRI

Set #124

Doors: B115, B116

3.0	Hinge	FBB179 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 0 N 14 C	626	BES
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Dome Stop	1211	630	TRI

Set #125

Doors: B139

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 AB 14 C LM PATD	626	BES

1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #126

Doors: A211, B114, B142, B152, B153, B157A, B157B, B158, B159, B160, B161, B162, B163

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 AB 14 C LM PATD	626	BES
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI

Set #127

Doors: A115A, A226, B136B, B146A

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Power Transfer	EPT-12C		PRE
1.0	Electromechanical Cylindrical Lock	9KW 3 7 DEU 14 C LM RQE PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Wiring Harness	WH-12P		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Wiring Harness	WH-6E		BES
1.0	Card Reader	BY SECURITY CONTRACTOR		
1.0	Door Position Switch	BY SECURITY CONTRACTOR		
1.0	Power Supply	BY SECURITY CONTRACTOR		

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RELEASES LEVER AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. RQE SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #128

Doors: A221, B117B, B136A, 136C, B150, B108

3.0	Hinge	FBB179 NRP 45X45	26D	BES
1.0	Power Transfer	EPT-12C		PRE
1.0	Electromechanical Cylindrical Lock	9KW 3 7 DEU 14 C LM RQE PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	5050 Head & Jambs (2)	B	NGP
1.0	Dome Stop	1211	630	TRI
1.0	Wiring Harness	WH-6E		BES
1.0	Wiring Harness	WH-12P		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Power Supply	BY SECURITY CONTRACTOR		

1.0	Door Position Switch	BY SECURITY CONTRACTOR
1.0	Card Reader	BY SECURITY CONTRACTOR

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RELEASES LEVER AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. RQE SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #129

Doors: B105B, B106B, B109B, B113B, B117A

1.0	Continuous Hinge	SL27 EPT	CL	SEL
1.0	Power Transfer	EPT-12C		PRE
1.0	Exit Device	2103 C MLR WTS CA-03	626W	PRE
1.0	Pull	1097 PHI	630	TRI
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Sweep	200S LAR	A	NGP
1.0	Drip Cap	16 4" ODW	A	NGP
1.0	Threshold	8425 LAR	A	NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Wiring Harness	WH-12P		BES
1.0	Wiring Harness	WH-6E		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Card Reader	BY SECURITY CONTRACTOR		
1.0	Door Position Switch	BY SECURITY CONTRACTOR		
1.0	Power Supply	BY SECURITY CONTRACTOR		

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RETRACKS LATCH AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. WTS SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #129.1

Doors: A106A, A123A

1.0	Continuous Hinge	SL27	CL	SEL
1.0	Exit Device	2101	626W	PRE
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Sweep	200S LAR	A	NGP
1.0	Drip Cap	16 4" ODW	A	NGP
1.0	Threshold	8425 LAR	A	NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		

Set #130

Doors: B120

1.0	Continuous Hinge	SL27 EPT	CL	SEL
1.0	Power Transfer	EPT-12C		PRE
1.0	Exit Device	2103 C MLR WTS CA-03	626W	PRE
1.0	Pull	1097 PHI	630	TRI

1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Sweep	200S LAR	A	NGP
1.0	Drip Cap	16 4" ODW	A	NGP
1.0	Threshold	8425 LAR	A	NGP
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Dome Stop	1211	630	TRI
1.0	Wiring Harness	WH-12P		BES
1.0	Wiring Harness	WH-6E		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Card Reader	BY SECURITY CONTRACTOR		
1.0	Door Position Switch	BY SECURITY CONTRACTOR		
1.0	Power Supply	BY SECURITY CONTRACTOR		

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RETRACKS LATCH AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. WTS SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #132

Doors: A115

3.0	Hinge	FBB168 NRP 5X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES

1.0	Door Closer	EHD90 16 SDS90	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing NGP	5050 Head & Jambs (2)	B	

Set #133

Doors: B121

1.0	Power Transfer	EPT-12C		PRE
1.0	Exit Device	2103 C MLR WTS CA-03	626W	PRE
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Pull	1097 PHI	630	TRI
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		
1.0	Dome Stop	1211	630	TRI
1.0	Wiring Harness	WH-6E		BES
1.0	Wiring Harness	WH-12P		BES
1.0	Wiring Harness	WH-192P		BES
1.0	Card Reader	BY SECURITY CONTRACTOR		
1.0	Door Position Switch	BY SECURITY CONTRACTOR		
1.0	Power Supply	BY SECURITY CONTRACTOR		

NOTE: DOOR NORMALLY CLOSED AND LOCKED PRESENTING VALID CREDENTIAL RETRACKS LATCH AND ALLOWS FOR INGRESS. EMERGENCY KEY OVERRIDE. WTS SWITCH IN PUSHBAR TO SHUNT ALARM UPON EGRESS. FREE EGRESS AT ALL TIMES.

Set #134

Doors: A125A, A125B, A126A, A126B, B105A, B106A, C106A, C106B, C108A, C108B, C109A, C109B, C111A, C111B, C113A, C113B, C115A, C115B, C116A, C116B, C118A, C118B, C119A, C119B, C125A, C125B

3.0	Hinge	FBB168 NRP 45X45	26D	BES
1.0	Exit Device	2108 CD D V4908	630	PRE
1.0	Rim Cylinder	12E 7 2 PATD	626	BES
1.0	Mortise Cylinder	1E 7 4 PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Dome Stop	1211	630	TRI
1.0	Gasketing	BY ALUM DOOR/FRAME MANUFACTURER		

Set #135

Doors: B147

3.0	Hinge	FBB168 NRP 5X45	26D	BES
1.0	Cylindrical Lock	9K 3 7 D 14 C LM PATD	626	BES
1.0	Door Closer	EHD90 16 AF90P	689	BES
1.0	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1.0	Dome Stop	1211	630	TRI
1.0	Gasketing NGP	5050 Head & Jambs (2)	B	

Set #201

Teachers Cabinets and Cabinets in Clinic (where noted on the drawings)

Cabinet Locks	5L, IE or 5E as required	626	BE

NOTE: Verify lock type, cam length and strike with Cabinet Contractor

Set #202

Perimeter Manuel Man Gate Single – 3’ x 6’ Square Post

3	Steel Gate Hinge w/Closer	RF 108S W 180	Black	DD
1	Steel Gate Hinge Only	RF SM W	Black	DD
1	Exit Device Keyed Entry	2103 x 4903D x Gate Width CD	626W	BE
1	Rim Cylinder	12E-72 PATD RP3	626	BE
1	Mortise Cylinder	1E-74 PATD R704	626	BE
1	Weldable Lockset Box	K-BXED-2000	Black	KE

NOTE: Gate manufacturer to provide Box Plates for lockset. Verify metal material and color with Architect

Set #203

Perimeter Manuel Man Gate Pair – 6’ x 6’ Square Post

3	Steel Gate Hinge w/Closer	RF 108S W 180	Black	DD
1	Steel Gate Hinge Only	RF SM W	Black	DD
2	Exit Device	2103 x 4903D x Gate Width CD	626W	PR
2	Rim Cylinder	12E-72 PATD RP3	626	BE
3	Mortise Cylinder	1E-74 PATD R704	626	BE
1	Removable Mullion	KR4954 x 154 x Steel Frame Height	SP28	VO
2	Mullion Seal	5100 S		NA
2	Weldable Lockset Box	K-BXED-2000	Black	KE

NOTE: Gate manufacturer to provide Box Plates for lockset. Verify metal material and color with Architect

Set #204

Manuel Sliding or Rolling Gates - CR

1	Padlock	21B-72L M5 PATD	626	BE
1	Pedestal Frame 42” x 64”	64-9CD	Black	PP
1	Mortise Cylinder	1E-74 PATD R704	626	BE
1	FD Key Box @ Gate Pedestal	3200-Knoxbox	AL	KB

Set #205

Roof Hatches

1	Padlock	21B-72L M5 PATD	626	BE
1	Door Position Switch	By Security Contractor if Required		BY

SECTION 08 8000

GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Glazing for the following products:
- 01 Interior Aluminum Frames
- 02 Aluminum Storefront System
- 03 Aluminum Curtain Wall System.
- 04 Aluminum Entrance Doors.
- 05 Hollow Metal Doors.
- 06 Plastic Laminate Doors.
- 07 Hollow Metal Frames
- 08 Mirror (excluding Mirrors in Toilet Accessories)

1.2 RELATED WORK

A. Interior Aluminum Frames- Section 08 1116

B. Aluminum Framing Systems- Section 08 4400

C. Hollow Metal Doors and Frames - Section 08 1110.

C. Plastic Laminate Doors - Section 08 8213.

D. Framed mirrors – Section 10 2810

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
- 01 Complete shop drawings by manufacturer, indicating elevations, sections, substrates, finishes, hardware and installation details.
- 02 Manufacturer's specifications and other data needed to prove compliance with specified requirements, and manufacturer's installation instructions.
- 03 Engineers calculations of performance requirements.

B. 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.

1.5 REFERENCES

A. American National Standards Institute:
ANSI 297.1 - 1975 Safety Performance Specification
ANSI 297.1 - 1972 Safety Glass Code

B. Federal Specifications:
Fed. Spec. DD-G-001403 B
Fed. Spec. TT-S-00230 Sealing Compound: Synthetic Rubber Base and TT-S-00203C
Fed. Spec. TT-S-001657 Sealing Compound: Butyl Rubber Base
Fed. Spec. DD-G-451d

1.6 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. Manufacturer qualifications for Insulating Glass Units with Sputter Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated glass manufacturer.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Source Limitation for Glass and Glazing Accessories: Obtain all glass and glazing accessories from single manufacturer for each glass type and product.

E. Glazing Publications: Comply with recommendations from GANA's "Glazing Manual" and from publications glass product manufacturers and IGMA Publication for Insulating Glass SIGMA TM-3000. "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use." Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

F. Safety Glazing Labeling: permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

G. Fire-Rated Glazing Labeling: Permanently mark fire-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, tests passed, whether glazing is for use in fire doors or other openings, temperature rise rating of 450 deg F, and the fire resistance rating in minutes.

H. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component life of units with appropriate certifications for materials and execution.

1.7 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating glass manufacturer agrees to replace insulating glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hemetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

01. Warranty Period: 10 years from date of Substantial Completion.

B. All glazing and metal framing not water tight shall be re-glazed at no extra cost to the Owner.

PART 2 - PRODUCTS

2.1 PERFORMANCE SPECIFICATIONS

A. Requirements apply simultaneously through the most adverse conditions of each exterior application.

01 Windloads: Design system to withstand positive and negative windloads normal to the plane of the wall as required by IBC, 2021 Edition.

02 Thermal Movement: 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.

03 Water Infiltration: 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. (Curtain wall and storefront at 12 lb./sq. ft. test pressures)

04 Air Filtration: Limit air leakage to maximum 0.06 cfm @ 6.24 psf of wall area.

2.2 MATERIALS

A. Glass

01 General:

a. Glass shall meet the requirements of Fed. Spec. DD-G-451-d

b. Float Glass: Care shall be taken to minimize the tong marks and, unless indicated otherwise on the drawings, the tong marks shall occur at the bottom of the glass (after installation).

B. Glass Types

01 Type “G1” Clear Float Glass – Polished Plate or Float, ASTM C1036, Type I, Class 1, Quality q3, 1/4” unless otherwise shown.

02 Type “G2” Clear Tempered Glass: ASTM C1048 Type 1, Plate or Float, Quality q3, fully tempered, 1/4” thick.

03 Type “G 3” Insulating-Laminated Glass: Low-E coated laminated clear insulating glass for typical exterior application where safety glassing is not required. Factory-assembled units consisting of sealed lites of glass separate” by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified. Overall nominal unit thickness: 1 inch. Minimum thickness o of each glass lite: ¼”. Indoor Lite: cleared anneal float glass; outdoor Lite: clear hear-strengthened float glass. Use fully tempered float glass where required to have safety glazing. Must meet the following properties:
Visible Light Transmittance (5): 35
Summer U-Value: 0.27
Winter U-Value: 0.29
Shading Coefficient: 0.29
Solar Heat Gain Coefficient (SHGC): 0.25

04 Type “G4”. Ceramic-coated, insulating spandrel glass with low-E coating. Same properties as Type “G3”

C. Glazing Gaskets:

01 Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including

02 Sealant:

a. One part acrylic polymer sealant conforming to Fed. Spec. TT-S-00230 or silicone, Fed. Spec. TT-S-0023-C. Use for glazing of all fixed glass. Include primer as recommended by manufacturer.

b. Color: Shall match frame and existing sealant

c. All sealants shall be compatible with adjacent material per manufacturer's instruction.

03 Setting Blocks: Hard rubber or clean grain softwood.

04 Back-up Material: Foamed polyethylene or polystyrene rodstock; 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 Fed. Spec. T-G-410 will be permitted. The use of nonskinning compounds, non-resilient type preformed sealers and preformed impregnated type gaskets will not be permitted.

D. Glazing Sealants:

01 Glazing Gaskets: Extruded neoprene conforming to ASTM C-502 (color "black"), sized to fit the frame.

02 Sealant: Comply with Fed. Spec. TT-S-00230

D. Mirror: (Unframed)

01 Glass: Plate or float, 1/4" thick, Class 1, mirror blazing quality.

02 Silvering: Electroplated copper backing with double paint protective coatin.

03 Edges: Rounded off and polished.

04 Mastic: Asphalt mirror setting cement approved by mirror manufacturer.

05 Clamps: Kape & Vogt No. 278 top, ¾". Provide 3/8" continuous aluminum J-shaped channel, as manufactured by J.G. Braun Co., for bottom support.

06 72" High, mount 4" above finish floor in locations shown on drawings.

2.3 MANUFACTURERS

A. Glass:

01 AFG Industries, Inc.

02 Libbey-Owens Ford Co.

03 Pilkington North America

05 PPG Industries

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. 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

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 to meet performance specifications using materials specified in Sealants - Section 07900. Follow sealant manufacturer’s printed instructions for the installation of his product.

H. 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. 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 PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass, except as specifically directed by the Architect.

END OF SECTION

SECTION 08 8710

WINDOW FILM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Security window film

1.2 SUBMITTALS

A. Comply with Section 01 3300

B. Product Data: Manufacturer's printed specifications, product data and installation instructions.

C. Document that the installer is a manufacture certified installer

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installer must be a manufacturer certified installer and eligible to receive the specified manufacturer's warranty.

1.4 WARRANTY

A. Manufacturer's Warranty on the security film- 12 years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Safety and Security Window Film
   01 3M Scotchshield Ultra S800 Safety and Security Window Film. Optically Clear microlayered polyester firm, nominally 8 mils thick with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive on the other.
   01. The film is clear and does not contain dyed polyester. The adhesive is pressure activated, not water activated, and forms a physical bond, not chemical bond, to the glass.

2.2 MANUFACTURERS

A. 3M Window Film.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The installer shall examine the glass surfaces receiving new film to verify that they are free from defects and imperfections, which will affect the final appearance.
B. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
C. Commencement of installation constitutes acceptance of conditions.

3.2 PREPARATION

A. Clean and prepare surfaces using the methods recommended by the manufacturer.

B. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Installer must be manufacturer certified installer.
B. Install on interior side of glass in accordance with manufacturer's printed instructions.
C. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING AND PROECTION

A. Remove material and debris from work area. Use necessary means to protect film before, during
B. And after installation
C. Touch up, repair or replace damaged products before substantial completion.
D. Wash film using common window cleaning solutions 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film.

END OF SECTION

SECTION 09 2200

LATH AND PLASTER

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Exterior cement plaster.

B. Interior gypsum plaster.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's specifications and product data

C. Samples.
   01 Color chart showing full range of colors for finish coat.
   02 12" x 12" sample of each type to be used.

1.3 QUALITY ASSURANCE

A. American Society for Testing and Materials
   01 ASTM C6-49, (1974) Normal Finishing Hydrated Lime
   02 ASTM C35-76, Inorganic Aggregates for Use in Gypsum Plaster. Type II
   03 ASTM C207-76, Hydrated lime for Masonry Purposes
   04 ASTM C-1063 installations of lathing and furring for Portland Cement plaster.
   05 ASTM C-926 application of Portland Cement plaster.
   06 ASTM C-91, Masonry Cement

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 Contractors Association/Texas Bureau for Lath and Plaster.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furring and Lathing
   01 Metal Lath. Expanded type, diamond shape, copper bearing steel, weighing 3.4#/sq.yd., galvanized. Use "dimpled" self-furring type on concrete surfaces. Paint galvanized lath inside Pool Area B only.
   02 Screws. Self-tapping, galvanized pan head. Stainless Steel inside Pool Area B only.
   03 Lathing Channels. Cold rolled from 16 gauge steel, hot dip galvanized 3/4" weighing 316 lbs. per 1000 lin. ft. Aluminum or Stainless Steel inside Pool Area B only.
   04 Main Runner Channels. 1-1/2" cold rolled galvanized channels weighing 508 lbs. per 1000 lin. ft. Aluminum or Stainless Steel (grade 304) inside Pool Area B only.

B. Accessories: Pure Zinc alloy unless otherwise noted.
   01 Casing Bead. 26 gauge expanded flange casing, with 3" wings and grounds of depth of plaster specified.
   02 Control joints. 26 gauge, double "V" design with 1 ¾" wings.
   03 Expansion joints. 26 gauge, equal to Keene #40.
   04 Corner Bead. 26 gauge expanded to wings of 2-5/8".

05 Interior Corner Reinforcement. 2" x 2" or corner master #30 USG self- edge cornerite, or Cornermaster #30.
06 Wire. Cold drawn annealed galvanized. Provide gauge nos. 8, 10, 12 and 14. Provide Stainless Steel, grade 304, inside Pool Area B only.
07 Drip Screed. Fry Reglet Corp., aluminum drip screed DS-875, or slotted vent DS-875 V-200 where shown.

C. Cement Plaster
01 Portland cement. Comply with ASTM C-150, Type I.
02 Lime. Comply with ASTM C-206, Type S and Fed. Spec. SS-L-00351a, Type F.
03 Sand. Provide sand that meets ASTM C-144 (Sharp Torpedo Type) finish coat graded per ASTM C842.
04 Water. Potable
05 Fiberglass Strands. 1/2 inch alkaline resistant.
06 Finish. Stucco finish unless otherwise noted.

D. Gypsum Plaster
01 Gypsum Cement. Comply with ASTM C-28 for gypsum plaster, STM C-61 for gypsum keene cement.
02 Lime. Comply with ASTM C-206.
03 Mixing Aggregate. Clean sand well graded from coarse to fine. Perlite and vermiculite lightweight aggregate for fire resistive use.
04 Sand. Comply with ASTM C-144 (sharp torpedo type) finish coat graded per ASTM C842.

2.2 MIXES

A. Portland Cement Plaster
01 Scratch and Brown Coat
1 sack Portland cement
2 sacks masonry mix
9 cu. ft. sharp torpedo plaster sand
1-1/2 lbs. of 1/2" alkaline resistant fiberglass strands
02 Brown coat for all Portland cement plaster shall be mixed in the same proportions as scratch coat with addition of 1 cu. ft. plastering sand and liquid and powdered waterproofing used according to the manufacturer's recommendations.
03 Stucco Finish Coat: Oriental Plaster Mix.
05 Acrylic Finish Coat: Factory mixed 100% pure acrylic based integral color.

B. Gypsum Plaster
a. Base coat lath, one part plaster to two parts sand by weight.
b. Brown coat, one part plaster to three parts sand by weight.
c. Finish coat, one part plaster to two parts sand.

2.3 MANUFACTURERS

A. Stucco
01 Lone Star Stucco
02 National Gypsum Co.
03 United States Gypsum Co.

B. Lath & Metal
01 Alabama Metal Industries Corp.
02 Bailey Metal Products Limited
03 Bostwick Steel Lath Co.
d. Marino Industries
05 United States Gypsum Co.
06 Western Metal Lath Co.

C. Acrylic Finish Coat
01 Dryvit

02 Finestone
03 R-Wall
04 Senergy
05 STO

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 retemper 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 at skylight if approved by the Architect in the field.

03 All galvanized hanger wires shall be spaced at 4'- 0" o.c. max. Do not use power actuated anchors through metal deck for wire supports.
04 Prepare all framing to receive recessed lights and control joints.
e. Exterior soffit locations provide 1 ½ cold rolled channel stiffeners secured to grid and structure above, space 8 ft., each way.

B. Metal Lath
01 Secure lath to channels by tying securely with two loops of #16 wire at 6" o.c. spacing maximum.
02 Lap metal lath at least 2 inches 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 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.

D. 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.

E. 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 18 lineal feet 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.

F. 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.
04 Finish Coat
a. Oriental Plaster mix at all ceilings and exterior soffits; apply and cure in accordance with manufacturer's written instructions. Match texture of approved sample.
b. Acrylic finish at all exterior walls. 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.

G. Gypsum Plaster
01 Apply base coat with sufficient force to form good bond. Allow to harden and scratch to produce rough surface.
02 Apply brown coast over base coat, rod and darby to produce true plane surface flush with grounds. Leave brown coat rough and allow to dry thoroughly.
03 Dampen brown coat and apply finish coat without noticeable ridges or joints. Float finish to even surface.
04 Use in all interior locations unless otherwise noted.

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 2900

GYPSUM WALLBOARD SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Interior metal framing system
B. Gypsum board
C. Sheathing Board at exterior walls

1.2 RELATED WORK

A. Light Gauge Steel Framing - Section 05410
B. Thermal Insulation - Section 07210
C. Acoustical Lay-In Ceilings - Section 09510
D. Acoustical Wall Panels - Section 09520

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data:
   01 Manufacturer's specifications and technical data
   02 Manufacturer's installation instructions

1.4 QUALITY ASSURANCE

A. Project Conditions: Do not install interior gypsum board and ceiling board until building is enclosed, sufficient heat is provided, roofing is complete, roof top equipment is fully installed and flashed and exterior wall openings are protected.

B. Reference
   01 ANSI A97.11
   02 ASTM A570, C36, C442, C636, C-79, C630
   03 Gypsum Association Publication GA-216: "Recommended Specification for the Application and Finishing of Gypsum Board"
   04 Fed. Spec. SS-L-30

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Framing System:
   01 Studs: Channel type screw studs and runner roll formed minimum G-40 galvanized steel with 33 ksi minimum yield strength, in widths indicated on drawings.
   02 Gauge: 25 gauge typical; 22 gauge where think brick or porcelain/ceramic tile will be applied.

B. Typical Wall and Ceiling Materials:
   01 General: Moisture-Resistant Paperless Glass-Mat Gypsum Board: ASTM C 1177/C1177M. Enhanced moisture-resistant, non-combustible gypsum core with inorganic embedded fiberglass mat on both faces; square edges. 5/8” thick. Equal to

DensArmor Plus Fireguard interior guard by G.P. Gypsum. Sizes shall be 4'-0" wide by longest practical length to minimize joints.

02 Channels: 16 gauge cold rolled steel channels with hot dip galvanized finish. Sizes as indicated on drawings. Use for suspended ceilings and elsewhere as indicated.

03 Furring Channels: Standard 2 3/4 inches wide, 7/8 inch deep galvanized sheet metal furring channel.

04 Corner Beads: No. 28 gauge galvanized steel, 1 1/4 inch legs. Use at all exterior corners.

05 Metal Trim: Steel casing (CJ-shaped or L-shaped as appropriate) used at all exposed edges of gypsum panels where gypsum board butts other materials.

06 Joint Compound (Taping): Standard types manufactured by gypsum wallboard manufacturer for intended use. Fire rated type must be used on fireproof systems.

07 Laminating Adhesives: Standard type manufactured or recommended by manufacturer of product to be laminated.

08 Ceiling Hanger and Tie Wire: 9 gauge galvanized hanger wire and 16-gauge tie wire.

09 Screws: 1" and 1-5/8" long self-drilling, self-tapping cadmium plated bugle head type.

10 Control Joints: Metal (USG #093) type with 1/4-inch open joint, perforated flanges for floating in place.

11 Wall Fixture Reinforcement: 6 inch, 14-gauge cold rolled steel galvanized channels or solid wood blocking provided by Section 06100.

C. Gypsum Sheathing. 1/2” thick x 4’-0” wide x min. 8’-0” long. Equal to Dens-Glass Gold Sheathing by G.P. Gypsum Corp.

2.2 MANUFACTURERS

A. Framing System and typical Gypsum Boards

01 Gold Bond

02 U. S. Gypsum Co.

B. Moisture resistant Gypsum Board and Sheathing Board

01 G.P. Gypsum

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. Ceiling Track: Fasten at 24-inch intervals, staggered. Where shown or required to extend above ceiling, brace to the structure at intervals not exceeding 4'-0".

C. Studs:

01 Single lengths positioned vertically in the runners, spaced 16 inches o.c., unless otherwise shown.

02 Install double studs at doorframe jambs. Install stud bracing on each side of opening at frame head height between jamb studs and adjacent studs.

D. Wall Reinforcement:

01 Provide solid bridging spanning between wall studs at all wall mounted fixtures, finish hardware, toilet partitions, wall cabinets, toilet accessories and similar items.

E. Chasewall Bracing:

01 Install cross bracing for chase wall construction

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.

B. Provide cement boards where ceramic tile, porcelain or thin brick is scheduled.

D. Install metal trim where indicated and when end is exposed.

E. Apply at least two coats of joint compound over beads; screw heads and trim, and each coat shall be feathered out onto panel faces.

F. Float out and sand joints to make joints invisible when painted with non-texture paint.

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. Provide control joints at all interior corners and at 30’-0” o.c. max. unless otherwise noted.

K. Place sound insulation in partitions tight within spaces, around openings, behind and around electrical and mechanical items within, behind partitions and tight to items passing through partitions.

3.3 SHEATHING INTALLATION

A. Install sheathing with gold side out.

B. Use maximum lengths possible to minimize number of joints.

C. Apply horizontally joints tight and neatly fit around penetrations through sheathing in order to provide a weather tight back up behind the masonry veneer.

D. Secure sheathing board to metal framing with specified screws spaced not over 8 inches o.c.

3.4 CEILING FRAMING INSTALLATION

A. Main Runners:

01 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. Ceiling framing to be properly positioned and leveled.

B. Furring Channels:

01 Space 16 inches o.c., and saddle-tie with two strands of 16 gauge tie wire to main runners or main support members. Do not let into or come in contact with abutting masonry walls. End splices shall be provided by nesting channels or studs no less than 8 inches and securely wire-tied.

3.5 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.

C. Provide control joints at 30'-0" o.c. max. unless otherwise noted.

3.6 CURVED GYPSUM WALLBOARD APPLICATIONS (PER USG #WB-1766):

A. Studs and Runners: USG ST25 steel studs and runners 3 5/8 inches wide. For support of outside runner leg, 1 inch x 25 gauge metal strip.

B. Fasteners:
   01 Runner Attachment to Supporting Structures of Floor and Ceiling: See paragraph 3.1.
   02 Stud Attachment to Runners: USG screws, pan head, type S, 3/8 inch for 20 gauge or lighter.
   03 Gypsum Panel Attachment: USG screws, bugle head, type S, 1 inch long for single-layer application and base layer of double-layer application. 1 5/8" long for face layer of double-layer application.

C. Gypsum Panels: Sheetrock brand gypsum panels, regular thickness of 1/4", 3/8" or 1/2", width of 48", lengths are required.

D. Joint Treatment: See paragraph 3.3

E. Installation: Cut leg and web of top and bottom runners at 2 inch intervals for the length of the arc with 90 degree maximum uniform curve. Fasten 1 inch 25 gauge steel strip inside the cut leg of both runners with USG Metal Lock Fastener. Secure runners to framing in the floor and ceiling. Install studs between runners, twisting them into position, spaced as shown on back of this sheet. Studs may be fastened to runners to lessen their movement. However, if you must allow for deflection, cut studs 3/8 inch less than floor-to-ceiling height and do not fasten to top runner. Anchor to ceiling and floor runners a; studs for shelf-walls and walls adjacent to door/window frames, partition intersections, corners and freestanding furring. Install gypsum panels as follows

Panel Thickness	1/4”	1/4”	3/8”	3/8”	1/2”	1/2”
Radius	2’0”	2’6”	3’0”	3’6”	4’0”	4’6”
Inside Length of Arc (2)	3.14’	3.93’	4.71’	5.50’	6.28’	7.07’
Outside Length of Arc (2)	44.0”	53.4”	62.8”	72.2”	81.6”	91.1”
No. of Studs on Arc, Including Those at Tangents (3)	9	10	9	11	8	9
Approx. Stud Spacing c. to c. (4)	5.50”	5.93”	7.85”	7.22”	11.70”	11.40”
Ounces of Water Required per Panel Side (5)	6” 30	6” 30	8” 35	8” 35	12” 45	12” 45

(1) For gypsum board applied horizontally to a 4-inch thick partition.
(2) Arc length = 3.14-R/2 (for a 90° arc)
(3) No. studs = outside arc length/maximum stud spacing + 1 (rounded up to next whole number).
(4) Stud spacing = outside arc length/no. of studs - 1 (measured along outside of runner).
(5) Wet only the side of panel that will be in compression. Water required per panel side is based on a 4’ x 8’ panel.

Cut Sheetrock brand gypsum panels so that when applied horizontally they will run a minimum of 1 foot beyond the arc. Wet the side of the panel which, when hung, is in compression. Apply the amount of water as shown above with a garden sprayer. Stack panels with wet sides face to face and cover with plastic sheet. Allow to set for one hour. Install panels on the convex side of the wall first. Begin at one end of the curved surface, wrapping and fastening the panels around the framing. On the concave side of the wall, begin at the center of the curve and work out in both directions. Screw fastener spacing is 12 inches o.c. in single-layer application; 16 inches o.c. for base and 12 inches o.c. for face layer in double-layer application. Allow panels to dry for 24 hours before finishing. Finish face panel joints, internal angles and exposed fasteners with a U. S. Gypsum System applied according to manufacturer’s directions.

3.7 WORKMANSHIP TOLERANCES

A. Visual: Correct any nicks, bumps, out-of-level or out-of-plumb areas detectable to the naked eye.

B. Walls: 3/8-inch maximum deviation from vertical.

C. Bumps in Boards: Maximum 1/8 inch in 24 inches

D. Corners: Maximum out-of-square 1/8 inch in 16 inches.

E. Float solid between corner beads less than 36 inches apart. Surfaces that appear concave are not acceptable.

F. Provide "J" mold and continuous 1/4 inch reveal wherever gypsum board directly abutts other material or when the end is exposed.

G. 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.

END OF SECTION

SECTION 09 3000

TILING

PART 1 - GENERAL

1.1 THIS SECION INCLUDES:

A. Ceramic Wall and Floor Tile
B. Porcelain Wall Tile
C. Quarry Tile
D. Mosaic Glass Tile
E. Marble Thresholds
F. Setting Materials
G. Trims and Accessories.
H. Metal Edge Protector

1.2 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 Tread: Minimum of 0.6 (Wet)
02 Ramp Surfaces: Minimum of 0.8 (Wet)

1.2 SUBMITTALS

A. Comply with Section 01 3300

B. Samples
01 Submit samples of selected tile mounted on 12” X 12” board indicating joint size and grout for approval.
02 Submit manufacturer’s installation instructions.

C. Certification: Provide Master Grade Certificate as specified in ANSI A137.1.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

B. Build mockup of each type of floor and wall tiles as directed by Architect.

C. Subject to compliance with requirements, approved mockups may become part of the complete work if undisturbed at time of Substantial Completions.

PART 2 - PRODUCTS

2.1 MOSAIC FLOOR TILE

A. Basis of Design: design is based on products indicated on Drawings manufactured by Daltile. Subject to compliance with requirements, provided named product or comparable product approved by Architect.

B. 2” x 2” x ¼” porcelain ceramic mosaic with cushioned edge. Colors as shown on drawings.

C. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoin flat tile. Provide shapes as follows, selected from manufacturers standard shapes:
   01 Base Cove: cove, module size 2”x1”.
   02 External Corners for thin set mortar installations: Surface bullnose, module size 2”x1”
   03 Internal Corners: Cove, module size 2”x1”.
   04 Installation: on mortar bed @ first floor; thin set @ second floor.

2.2 CERAMIC WALL TILE

A. Basis of Design: design is based on Daltile “Color Match”, Subject to compliance with requirements, provided named product or comparable product approved by Architect.

B. Modular Sizes: 12”x24”x 5/16” and 4”x12”x5/16” with cushioned edge. Colors and patterns: as shown on drawings.

C. Trim Units:
   01 External Corners: aluminum trim
   02 Interior Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.
   03 Wainscot Cap: Surface bullnose, module size 8”x4”

D. Thin set Installation.

2.3 PORCELAIN TILE

A. Basis of Design: design is based on Crossville “Argent” & “Twin Peak” Porcelain Stone. Subject to compliance with requirements, provided named product or comparable product approved by Architect.

B. Through-body unpolished porcelain tile. Sizes, colors and pattern are as shown on drawings. 4” bull nose units where shown.

C. Thin set Installation.

2.4 GLASS WALL TILE

A. Basis of Design: design is based on products indicated on Drawings manufactured by Daltile. Subject to compliance with requirements, provided named product or comparable product approved by Architect.

B. 1”x1” and 1”X6” mosaic glass.

C. Location: face of serving counters. Colors and Patterns as shown.

D. Thin set Installation.

2.5 QUARRY TILE

A. Basis of Design: design is based on products indicated on Drawings manufactured by Daltile. Subject to compliance with requirements, provided named product or comparable product approved by Architect.

B. Modular Size: 6”x6”x1/4” unpolished quarry tile. Color as shown on drawings.

E. Mortar bed shall be Portland cement, full bed method.

2.6 THRESHOLDS

A. Marble complying with ASTM C503 with a honed finish. Color as selected by Architect from the manufacturer’s standard range.

B. Size: fabricate 2” wide by full width of wall or frame opening; ½” thick, beveled on long edge with radius corners on top side, without holes, crack or open seams.

2.7 WATERPROOF MEMBRANE

A. Manufacturer’s standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application, include reinforcement and accessories recommended by manufacturer.

2.8 MORTAR ADHESIVE AND GROUT MATERIALS

A. For Walls
- 01 Organic adhesive, ANSI A136.1, Type I. Provide primer-sealer over substrate where recommended by adhesive manufacturer.
- 02 Grout: Cement grout, sanded or unsanded, as specified in ANSI A118.7, color as selected.

B. For Floors other than Quarry Tile:
- 01 Dry-Set Portland Cement Type. ANSI A118.1.
- 02 Latex-Portland Cement type: ANSI A118.4
- 03 Epoxy: ANSI A118.3, 100% solids.
- 04 Grout: Cement grout, sanded or unsanded, as specified in ANSI A118.7

C. For Quarry Tile Floors
- 01 Mortar bed shall be Portland Cement, full bed method.
- 02 Grout: Epoxy Grout “Laticret” SP-100 (no substitution), color as selected.
- 03 All quarry tile shall be sealed with Aqua Mix quarry tile sealer.

2.8 EDGE PROTECTOR

A. “Schluter” QUADEC square profile corner protector, polished chrome anodized aluminum finish.

B. Use at all outside corners at porcelain wall tile and ceramic wall tile.

2.9 EXPANSION JOINTS

A. Latex compound sealant over filler. Provide all concrete foundation control joints at all wall corners, ceilings, control joints and changes in materials. Maximum 24' o.c. elsewhere. Sealant shall match grout color. Tile Council of America #EJ171-89.

2.4 MANUFACTURERS

A. Tile except Porcelain Wall Tile:
   01 American Olean Tile Co.
   02 Dal-Tile

B. Porcelain Wall Tile:
   01 Crossville

B. Grout
   01 C – Cure Chemical Co., Inc.
   02 Texas Cement Products, Inc.
   03 Laticrete
   04 Upco

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 Sloped to drains where floor drain occurs.
   04 Minimum of 40 degrees 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. 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.

3.2 INSTALLATION

A. General
   01 Align joints (no staggering)
   02 Set interior wall tile in accordance with Tile Council of America, Inc. Spec. W-243-03 for gypsum board substrate. Set interior wall tile on CMU in accordance with T.C.A. Spec. W –211-3. Provide minimum size of joints as allowed by TCA.
   03 Set floor tile and grout in accordance with Tile Council of America, Inc. Spec. F112-2K and F113-2K (Allow minimum of 24 hours after tile is set before grouting). Slope tile to floor drains.
   04 Lay out tile so that the minimum size tile used is 1/2 size.
   05 Form internal angles square.
   06 Install expansion joints in accordance with TCA publication EJ 171-89.
   07 Damp cure grout in accordance with manufacturer's recommendations. Clean all tile surfaces upon completion. Protect finish tile work from damage.
   08 Install isolation membrane over cracks or joints where recommended by manufacturer. Use Dal-Seal CIS sheet or approved equal of minimum required width of 3 times tile size.
   09 Install elastomeric grout joints (soft joints) comply with TCA Handbook recommendation EJ171 and construction a compressible joint at closest grout joint in tile work.
   10 Install corner protector in accordance with manufacturer's instruction.

11 Install thresholds where indicated or required.
12 Keep expansion joints/control joints free of adhesive or grout. Apply sealant to joints.
13 Keep interior corner free of adhesive or grout. Apply sealant to joints.
14 Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

B. Installation
01. For floor-thin-set methods, install in accordance with TCA Handbook Method F113.
02 For floor-mortar bed methods, install in accordance with TCA F101.
03 At shower walls, install tiled shower receptors install in accordance with TCA Handbook Method B415.
04 At cementitious backer boards, install in accordance with TCA Handbook Method W223, organic adhesive.
05 At CMU walls, install in accordance with TCA Handbook Method W303, think-set with dry-set or latex Portland cement bond coat.

3.3 EXTRA STOCK

A. Deliver to the Owner 25 square feet of each color and pattern of tile selected at Substantial Completion of the project.

END OF SECTION

SECTION 09 5100

ACOUSTICAL LAY-IN CEILING

1.1 THIS SECTION INCLUDES:

A. Suspension System

B. Acoustical Ceiling Boards

C. Perimeter Trims and accessories for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 03 3300.

B. Product Data: Manufacturer's specifications and technical data.

C. Samples: submit two units for each type of acoustical unit, suspension system and accessories.

1.3 QUALITY ASSURANCE

A. Projection Conditions
   1. 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.
   2. Maintain temperature at minimum 60 degrees F° and humidity if 40% to 50% prior to, during, and after installation.

B. References
   1. American Society for Testing Materials:
      ASTM C635
      ASTM C636
      ASTM E795
      ASTM E84
   2. Underwriters Laboratories assembly, as noted on drawings.

1.4 WARRANTY

A. Manufacturer shall warrant the acoustical lay-in system against sag, warpage and the occurrence of 50% red rust on grid 15 years.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Suspension System:
   01 Typical Grid
      a. Prepainted standard cold-rolled steel electro-zinc coated (ASTM C635).
      b. UL rated assemblies as indicated on drawings.
      c. Color: Low sheen satin, white.
      d. Main runners & cross tees to be 1 1/2 inches.
      e. Stabilizer bars, clips, splices and hold down clips as required for suspended grid system.
      f. Armstrong “Prelude” grid system or USG “Donn” grid system.

B. Hanger Wire:
   01 12-gauge steel wire
   02 Spacing at 4'-0"‘ o.c. both directions, wrapped tightly at least 3 full turns.

C. Lay-in Board:
   01 Type “A”:
      a. Mineral fiber.
      b. 24” x 24” x 5/8” thick; square edge
      c. Sound absorption. NRC range .50-.60 min.
      d. Finish. Painted white
      e. Pattern. Armstrong Fine-Fissured Humiguard with Bioblock or USG Radar ClimaPlus.
   02 Type "B":
      a. Un-perforated vinyl face on gypsum board
      b. 24" x 24" x 1/2" thick; square edge
      c. Color: White

D. Perimeter Trim:
   01 Equal to Armstrong Axiom Trim.
   02 Straight and Curved shape as shown on drawings.
   02 Perimeter shall be aluminum and integrate with the ceiling suspension system
   03 Heights as shown on drawings..
   04 Color to match the grid.

D. Accessories:
   01 At all locations (whether detailed or not) where an acoustical lay-in ceiling abutts a gypsum board ceiling in the same plane, provide a "W" shaped reveal or "shadow" molding similar to USG #MS 174.
   02 Provide Kenbeck Flexmold at all curved ceiling edges.

2.2 MANUFACTURERS

A. Armstrong World Industries, Inc.

B. U. S. Gypsum

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.

B. Ensure that wall control joints are flat and will not cause wall mold to misalign at those locations.

C. Coordinate all locations of cut tile with Architect in field, prior to commencing work.

D. Do not install any ceiling tile until all above ceiling inspections and corrections have been completed.

3.2 SUSPENDED CEILING SYSTEMS

A. Install ceiling systems by skilled workmen in accordance with manufacturer's printed instructions, the approved shop drawings and reflected ceiling plans. Exposed surfaces of acoustical units shall

be level and flush, with all joints straight and true. Cutting and fitting around all items protruding through acoustical ceiling shall be done neatly. Edge moldings and runners shall have flush hairline joints, with all corners mitered.

B Install main beam and cross tees in accordance with reflected ceiling plans. Suspend main beams from structure above (but not bridging), by means of #12 gauge galvanized wire, located 4 feet on center. Use of powder actuated fasteners to steel deck is not permitted. Join cross tees to main beam with a positive interlock. At perimeter areas, secure angle molding to vertical surfaces, ends of tees to rest on bottom flange of molding.

C. Align beams or tees with angle molding at corners, unless authorized by Architect.

D. Attachment of grid members to wall molding with pop rivets is not permitted. 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 hold down clip at ceiling in P.E. and where required by the Code. Provide an access tile adjacent to each equipment or disconnect located in ceiling plenum. Mark the tile with a thumb tack.

F. Provide light fixture protection as required by the UL assemblies.

3.3 ADJUSTMENT

A. Touch-up scratches, abrasions, voids and other defects in painted surfaces.

B. Adjust sags and twists which develop in ceiling system and replace units and parts that are damaged or faulty as directed by Architect.

3.4 EXTRA STOCK

A. Furnish two (2) unopened manufacturer's cartons of each type.

B. Deliver to location as directed by Owner at Substantial Completion.

END OF SECTION

SECTION 09 5300

ACOUSTICAL CEILING BAFFLES

1.1 THIS SECTION INCLUDES:

A. Custom suspended acoustical baffles

B. Accessories for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 03 3300.

B. Product Data: Manufacturer's specifications and technical data.

C. Samples: submit two units for each type of acoustical unit, suspension system and accessories.

1.3 QUALITY ASSURANCE

A. Projection Conditions
   1. Do not install acoustical baffles until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead mechanical work is completed, tested and approved.
   2. Maintain temperature at minimum 60 degrees F° and humidity if 40% to 50% prior to, during, and after installation.

B. References
   1. American Society for Testing Materials:
      ASTM C423-17, Type J
      ASTM E84- Class A
      ASTM D5116 Compliant

1.4 WARRANTY

A. Manufacturer shall warrant the acoustical baffles against sag, warpage, deformed for 5 years.

PART 2 – PRODUCTS

2.1 MATERIALS/PRODUCTS

A. Design is based on Turf Contour by Balden Contract Group (Contact: Chase Aquino 713-770-6075.

B. 9 mm thick felt. Custom shaped in sizes as shown. Color: six (6) different colors will be chosen from the manufacturer’s standards.

C. Provide embedded cable grippers, snap into deck- mounted aircraft cables.

   03 Heights as shown on drawings..
   04 Color to match the grid.

D. Accessories: As required for a complete installation.

PART 3 - EXECUTION

3.1 INSTALLTION

A. Ensure that all conditions are acceptable. Commencing work shall be construed as acceptance of preceding work performed by others, as suitable to receive work specified in this Section.

B. Do not install any ceiling tile until all above ceiling inspections and corrections have been completed.

C. Install according to manufacturer's written directions.

D. Adjust all shapes are plumb and aligned.

END OF SECTION

SECTION 09 6115

CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Concrete floor sealer.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's technical data, application instructions and coverage rates.

PART 2 - PRODUCT

2.1 MATERIALS AND MANUFACTURERS

A. Sonneborn Kure-N-Seal WB

PART 3 - EXECUTION

A. Concrete slabs shall be smooth, dry, and free of any foreign materials.

B. Ensure that sealer and finish is compatible with any chemical curing agent previously applied.

C. Thoroughly clean subfloor of all wax, oil, dusting, dirt or other deleterious material.

D. Apply sealer when all trades are completed and structure is ready for occupancy.

E. Apply sealer in strict accordance with the manufacturer’s recommendations. Apply two coats uniformly and avoid drips or puddles showing in finished work.

END OF SECTION

SECTION 09 6419

STAGE FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Finished oak flooring and steps at Platform as shown on drawings.

B. Installation, sanding and finishing of wood flooring.

1.4 QUALITY ASSURANCE

A. Applicator: Five years minimum experience in installation of type specified.

B. Uniformity: To maximum extent possible, obtain flooring materials from one manufacturer to ensure uniformity of quality and color.

C. Verify moisture content of all materials prior to installation and finishing.

D. Installation shall be supervised by Manufacturer's representative.

1.5 SUBMITTALS

A. Comply with Section 01300.

B. Product Data: Manufacturer's technical data, specifications and instructions for each type of wood flooring, including installation, storage, finishing and maintenance recommendations.

C. Samples: Color range samples for each type of wood flooring, including finish on 75% of each sample.

1.6 DELIVERY, STORAGE AND HANDLING

A. Moisture Content: At time of delivery, limit average moisture content of all wood flooring materials to 12%, with 14% maximum for any piece.

B. Protect wood flooring materials from excessive moisture in shipment, storage, and handling. Deliver materials in unopened bundles and store in dry place with adequate air circulation.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of wood flooring until spaces have been enclosed and are at approximate humidity condition planned for occupancy. Condition wood for 5 days prior to start of installation, by placing in spaces to receive flooring, and maintaining ambient temperature between 65-70° F before, during, and after installation.

1.8 SPECIAL PROJECT WARRANTY

A. Submit a three-year warranty signed by Manufacturer, Installer, and Contractor, agreeing to repair or replace wood flooring that shrinks, warps, cracks, or otherwise deteriorates excessively, or which breaks its anchorage or bond with substrate or otherwise fails to perform as required, due to failures of materials or workmanship not due to unusual exposure to moisture or other abusive forces or elements not anticipated for application.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood Flooring, Risers and Treads:
   01 Tongue and groove end matched select grade white oak milled and graded to NOFMA specifications.
   02 Size: ¾" x 2 ¼", unless indicated otherwise on the Drawings.
   03 Subfloor: ¾" plywood, fire-retardant treated. Installed with 8d machine driven fasteners.
   04 Mastic and Primer: As recommended by wood flooring manufacturer.
   05 Felt: 15 lb. asphalt-saturated felt.
   06 Cleaning Solvent: Cleaner-degreaser
   07 Nails: Machine-driven fasteners of a size recommended by floor manufacturer with a minimum length of 2 inches.

B. Wood Blocking, sleepers and similar subflooring materials shall be minimum no 2 grade southern yellow pine.
   01 Provide in sizes required to achieve finish elevations of oak flooring as details.

C. Trims: Provide no. 1 grade white oak trim in sizes and configurations indicated on the Drawings at all transitions to dissimilar adjacent finish materials.
   01 Verify all conditions and requirements

D. Finish all oak flooring and stairs in accordance with Section 09 9000.
   01 Provide multiple samples of various stain finishes to Architect for final selection.

E. Vented Base: Anchored to wall, supplied by floor manufacturer - oak

H. Continuous Extruded Aluminum Coverplates: At floor finish transitions provide continuous aluminum cover plates at material transition at Platform.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the Architect.

3.2 PREPARATION

A. The subfloor shall be swept broom clean, free from all debris and dust.

3.3 INSTALLATION OF WOOD FLOOR

A. Install hardwood flooring strips square with room, allow ½ inch expansion voids at perimeter and all vertical obstructions.

B. Fasteners shall be blind-nailed using fasteners driven at 45~50 degree angle at 10”~12” spacing with a minimum of two fasteners per strip.

3.4 FINSHING

A. Finishing sanding must be done until other interior work is completed and finishing shall be done within three weeks of completed installation.

B. Sand floor smooth using a heavy power-driven sander. Start with No.2 sand paper, use No.1/2 sandpaper for second sanding and No. 0 or N0.)) for 3rd sanding. First sanding shall be cross grain and the second and third sanding shall be with grain. Hand-scrape and hand-sand or use small machine in hard-to-reach places.

C. Final sanding must be followed the same day with sweeping and vacuuming of floor until surfaces are free of sanding dust. No water shall be used for cleaning.

D. Finish with 2 coats of specified sealer and 2 coats of wax as recommended by manufacturer. Allow each coat to dry thoroughly.

E. Protect flooring from construction traffic and damage with heavy paper until substantial completions.

END OF SECTION

SECTION 09 6500

RESILIENT BASE AND STAIRTREAD

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Resilient Cove Base

B. Rubber Stair tread.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacture's specification data and installation instructions.

C. Samples. Submit full range of colors and patterns for Architect's selection.

D. Maintenance Data. Include in the final close-out documents the maintenance data describing the procedure to be followed in maintaining the materials.

E. Asbestos Free Materials. Provide a written notarized statement indicating that all materials used are totally asbestos free.

1.3 QUALITY ASSURANCE

A. Vinyl Composition Tile. Fed Specs SS-T-312, Type IV Composition I

PART 2 - PRODUCTS

2.1 RESILIENT MATERIALS

A. Materials

01 Base:

a. Quality Standard. FS SS-W-40, Type I rubber base with matching end stops.
b. Type. Topset cove; full rolls.
c. Height. 4 inches, unless shown otherwise
d. Thickness. Full 0.125
e. Color. As selected by Architect.

02 Resilient Reducer Strips:

a. 1" wide x 1/8" thick, vinyl or rubber, tapered or bullnose edge, color as selected by Architect from manufacturer's standard colors.

03. Resilient Stringer Skirt:

a. Cut to match riser and tread profile, and to meet wall base height of same material, color and thickness as base.

B. Manufacturers:
   01 Armstrong World Industries
   02 Burke Floor Products, Co.
   03 Flexco
   04 Mercer Plastics Co., Inc.
   05 R. C. Musson Rubber Co.
   06 Roppe Rubber Co.

2.3 RUBBER STAIRTREAD

A. Materials
   01 One-piece nosing, tread-riser rubber stairtread.
   02 The top surface shall have round pastrilles.
   03 The bottom surface shall be flat back, sanded for maximum adhesion.
   04 Matching material at landings.
   05 By Nora Rubber Flooring
   06 Color. “Nora” 825 1902 Color # 0882.

B. Manufacturers:
   01 Nora Rubber Flooring (no substitution)

2.4 PRIMERS AND ADHESIVES

A. Concrete Slab Primer: Non-staining type as recommended by material manufacturers.

B. Adhesives: Waterproof, stabilized type as manufactured by resilient material manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. 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. General:
   01 Install materials only after finishing operations (including painting), have been completed, and after permanent heating and cooling system is operating.

02 Verify that moisture content of concrete slabs, building air temperature, and relative humidity are within the limits recommended by the manufacturers of the materials used.

B. Installing Resilient Tiles:
   01 Place units with adhesive cement in strict compliance with the manufacturer's recommendations.
      a. Butt units tightly to vertical surfaces, nosings, edgings, and thresholds.
      b. Scribe, as necessary, around obstructions and to produce neat joints.
      c. Place tiles tightly laid, even, and in straight parallel lines.
      d. Extend units into toe spaces, door reveals, and in closets and similar spaces.
      e. If tile butts a wall with ceramic tile, then the joint shall be caulked.
   02 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 4 inches wide at edge of space.
      b. Lay units square to axis of the room or space.
   03 Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.
   04 Lay in alternating pattern with grain in all units running 90 degrees from adjacent unit.
   05 Place resilient edge strips tightly butted to units and secured with adhesive, providing at all unprotected edges, unless otherwise shown.

C. 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.

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.

END OF SECTION

LLSECTION 09 6519

LUXURY VINYL TILE

PART 1 – GENERAL

1.1 THIS SECTION INCLUDES

A. Solid vinyl floor tile.

B. Accessories necessary for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: For each type of product.

C. Samples: Full-size units of each color and pattern of floor tile required.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated (LVT Resilient).

1. Engage an Installer who employs workers for this Project who are trained for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 68 degrees F nor more than 72 degrees F for a minimum period of 24-48 hours or until individual temperatures are met. Store floor tiles on flat surfaces.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 68 degrees F nor more than 72 degrees F in spaces to receive floor tile during the following time periods.

1. 48 hours before installation.
2. During Installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 58 degrees F nor more than 72 degrees F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to heavy traffic for 48 hours after floor tile installation and to light foot traffic for 24 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, drywall, etc., have been completed.

1.6 WARRANTY

A. Provide 25 (twenty-five) year wear layer warranty against finishes becoming unserviceable and objectionable appearance resulting from defective or nonconforming materials.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Tarkett Color Beam or a comparable product approved by Owner.

B. Tile Standard: ASTM F1700.

1. Class: III
2. Type: B

C. Nominal Thickness: 0.120 inch

D. Size: 6” by 36 inches.

E. Seamless-Installation Method: Wet Set Adhesive, supplied.

F. Colors and Patterns: Heritage in color as shown on drawings.

2.2 INSTALLATION MATERIALS

A. Trowelable Cementitious Leveling and Patching Compounds: Latex-modified, Portland cement based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall be certified to meet GreenGuard limits for VOC content.

2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.” (Prop 65 compliant).

C. Resilient Accessories: as required for a complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maxiumum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's writteninstructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, aor silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perfrom tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 nor more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maxiumum moisture-vapor-emission rate of 6 lbs. of water/1000 sq. ft. in 24 hours.

b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maxiumum 75 or lower percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable cementitious leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

2. Room should be controlled by HVAC at a temperature of between 68 degrees F and 72 degrees F.

3. Immediately before installation, sweep and vacuum clean substates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than on-half tile at perimeter.

   1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaed, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

   1. Lay tiles carefully, noting directional arrows on the back of tiles when present in pattern of colors and sizes indicated.

   2. Some pre-blending may be required depending on color or shade variation, refer to section 2 of Installation instruction on Centiva website.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center fo door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader mars, and other surface imperfections.

H. Seamless Installation:

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

   1. Remove wet adhesive and other blemishes from exposed surfaces with a damp cloth.

   2. Sweep and vacuum surfaces thoroughly.

   3. Damp-mop surfaces to remove marks and soil after 48 hours.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Remove soil, adhesive, and blemishes from floor tile surfaces.

   1. Not less than 48 hours after installation, clean floor with a Centi Clean Green neutral liquid cleaner.

E. Cover floor tile until Substantial Completion if foot traffic is required immediately.

3.5 EXTRA STOCK

A. Deliver to the Owner, for his future use, 2(two) unopened boxes of floor tile installed.

END OF SECTION

SECTION 09 6543

LINOLEUM FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Linoleum Sheet Flooring

B. Accessories required for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacture’s specification data and installation instructions.

C. Samples. Submit full range of colors and patterns for Architect's selection.

D. Maintenance Data. Include in the final close-out documents the maintenance data describing the procedure to be followed in maintaining the materials.

E. Asbestos Free Materials. Provide a written notarized statement indicating that all materials used are totally asbestos free.

1.3 QUALITY ASSURANCE

A. ASTM F2034

B. 100% USDA Certified Biobased Product. Compliant with CDPH 01350 requirements for VOC emissions and indoor air quality.

C. Slip Resistance: meet or exceeds the industry recommendation of >0.5 for flat surface tested in accordance with ASTM D2047.

D. Fire Testing: Class 1 when tested in accordance with ASTM E648/NFPA253.

PART 2 - PRODUCTS

2.1 Linoleum Sheet Flooring:

A. Materials
   01 Equal to Forbo Marmoleum Linoleum Sheet Resilient Flooring Covering.

   02 Patterns and Colors. as selected.

B. Manufacturers:
   01 Forbo Flooring System

2.4 PRIMERS AND ADHESIVES

A. Concrete Slab Primer: Non-staining type as recommended by material manufacturers.

B. Adhesives: Waterproof, stabilized type as manufactured by resilient material manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. 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. General:
   01 Install materials only after finishing operations (including painting), have been completed, and after permanent heating and cooling system is operating.
   02 Verify that moisture content of concrete slabs, building air temperature, and relative humidity are within the limits recommended by the manufacturers of the materials used.

B. Installing Linoleum Sheet Flooring
   01 Install Linoleum Sheets in accordance with manufacturer’s written instructions.
   02 Use adhesives as recommended by the Manufacturer.
   03 Install one sheet at a time.
   04 Install sheets in the same direction.
   05 Each sheet must be trimmed to fil and that factory edge be properly removed b adhering.
   06 All seams must be net-fit seams with no gaps or fullness.
   07 Seams must be minimum 6” from concrete control/construction joints.
   08 If cross seams must be made, follow the manufacturer’s step-by-step instructions.
   09 Store Linoleum rolls standing upright.

3.3 CLEANING AND PROTECTING

A. Do not allow heavy traffic or rolling loads for a minimum of 72 hours following the installation.

B. Wait for minimum of 5 days after installation before initial cleaning.

C. Clean the Linoleum Sheets by using neutral cleaner recommended by the Manufacturer.

3.4 EXTRA STOCK

A. Deliver to the Owner for his future use an extra stock of one roll of each color and pattern of tile selected.

END OF SECTION

SECTION 09 6566

INDOOR RESILIENT ATHLETIC SURFACING

PART 1 – GENERAL

1.1 THIS SECTION INCLUDES

A. Indoor resilient multipurpose surfacing

B. Application of the game lines

C. Accessories necessary for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Manufacturer's specifications and installation instruction.

C. Shop drawing showing proposed seam layout, game line layout and accessories to be used at floor transitions.

1.3 QUALITY ASSURANCE

A. The indoor resilient multipurpose surfacing shall have been in business a minimum of ten (10) years.

B. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for installation of indoor resilient flooring and have worked on at least five (5) projects of similar size, type and complexity.

1.4 DELIVERY, STORAGE AND HANDLING

A. Material shall not be delivered until all related work is in place and finished or proper storage facilities and conditions can be provided.

B. Store the material in a secure, clean and dry locations. Maintain temperature between 55º and 85º F.

C. Store the indoor resilient athletic surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to jobsite.

D. Rolls shipped in rigid protective cardboard containers can be laid horizontally prior to unpacking and installation.

1.5 FIELD CONDITIONS

A. Maintain a stable room temperature of at least 65º F for a minimum of one week prior to, during and after the installation.

B. Concrete subfloor pH level within the 7 to 11 range.

C. Concrete floor shall be level, max 1/8" deviation within a 10' diameter, measured in accordance with ASTM E1155.

D. Concrete subfloor shall be clean and free from all foreign materials and objects including, but not limited to, curing compound and sealer.

E. Fill cracks, grooves, voids, depressions and other minor imperfections. Follow the manufacturer's directions. Movable joints must be treated utilizing specific transitioning joint devices per Architect's recommendation. Follow ASTM F710 guidelines for the preparation of concrete slabs to received resilient flooring.

1.6 WARRANTY

A. Provide manufacturer's 25 (twenty-five) year warranty against material defects and surface wear-through of wear layer per ASTM F410/ASTM F1303 from the Date of Substantial Completion.

B. Provide manufacturer's 25 (twenty-five) years for moisture tolerance from the Date of Substantial Completion.

C. Installer shall provide 2 (two) year warranty for poor workmanship and faulty installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The basis of the design for the indoor resilient sports surfacing is Omnisports Multi-Use as manufactured by Tarkett.

B. or approved equal.

2.2 MATERIAL

A. Prefabricated sport surface 6.2 mm (0.14") with wood flooring design, single surface embossing and Dxtreme Three (3) layers technology as supplied by Tarkett.

1. Embossing of wood design and solid colors must be the same; varying embossing or surface textures will not be allowed.

2. Printing of wood design shall closely resemble standard wood strip flooring in size, color, board length, and grain appearance.

3. Surface embossing combined with TopClean XP must offer proper balance of surface friction per the ASTM F2772.

4. Surface embossing combined with TopClean XP must provide resistance to stains and scratches. Surface profile must not incorporate linear embossing.

5. The wood design shall be protected by a clear layer of pure PVC (Polyvinyl Chloride) and TopClean XP, a factory-applied UV cured urethane treatment.

6. Extreme Three (3) Layers technology (X3LT) includes Omnisports XCS cushion, glass veil and calendared sheet must offer improved shock absorbing comfort while providing recovery

7. The XCS cushion force reduction layer shall be high-density closed cell PVC foam with honeycomb embossing, and is applied in one continuous manufacturing processor adhered foam layers will not be allowed.

B. Vapor Retarder:

1. Tarkolay by Tarkett

2. Moisture tolerance shall be no limitation per ASTM 2170.

C. Welding Rod: supplied by indoor resilient athletic surfacing manufacturer or supplier. Color to blend with the indoor resilient athletic surfacing color or design.

D. Adhesive: As approved by the indoor resilient athletic surfacing manufacturer.

E. Game Line Paint and Primer: As approved by the indoor resilient athletic surfacing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SURFACES

A. Sand entire surface of the concrete slab

B. Sweep entire concrete slab so as to remove all dirt and dust. Concrete slab must be dust free.

3.3 INSTALLATION

A. Install Vapor retarder in accordance with manufacturer’s written instruction.

B. Install indoor resilient sports flooring in accordance with manufacturer’s written instruction. Install the flooring to minimize the cross seems per approved shop drawings. Route joints and heat weld to permanently and seamlessly fused sections together.

C. Apply game lines per approved shop drawings

D. Install thresholds, saddles or transition pieces where required.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer’s written instructions for cleaning and protecting the resilient flooring.

B. Protect the indoor resilient sports flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

3.5 EXTRA STOCK

A. Deliver to the Owner, for his future use, 1 roll of the flooring installed.

END OF SECTION

SECTION 09 6603
SAND CUSHION TERRAZZO

PART 1 - GENERAL

1.1 SECTION INLCUDES

A. sand cushion terrazzo and accessories necessary for the installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's technical data and installation instructions.

C. Shop Drawings.
   01 Complete shop drawings for layout of divider strips, control joint strips, and border strips for Architect’s approval.

D. Samples
   01 Prior to starting application of flooring, provide full scale mock-up to establish acceptable quality, durability and appearance. Mock-up area must not be less than 60 sq. ft.
   02 Accepted work may remain in place.

1.3 QUALITY ASSURANCE

A. References
   01 Conform with all applicable requirements of "Terrazzo Specifications and Technical Data" as published by the National Terrazzo and Mosaic Association, Inc. - latest edition.

B. Supplier and Installer
   01 Materials used shall be the products of a single manufacturer.
   02 Acceptable installer shall be a contractor member of the NTMA to perform work in accordance with NTMA standards.
   03 The Installer must have minimum 5 years experience in work of similar nature and scope.
   04 The Installer must have completed minimum three projects of similar magnitude and complexity.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials
   01 Deliver materials in a manner to prevent damage to containers and/or bags.

B. Storage of Materials
   01 Store materials in clean dry location.

1.5 PROTECTION OF ADJOINING SURFACES

A. The terrazzo applicator shall take appropriate measures to isolate adjoining finished surfaces from his operation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sand Cushion Terrazzo

01 Portland Cement. ASTM C150 Type 1, (white Portland cement) to match samples or colors selected.

02 Sand. Clean, hard, natural or manufactured conforming with ASTM C33 for fine aggregate.

03 Mortar Bed Fill. One part Portland Cement and four parts clean, coarse, screened sand. Color- tinted gray or white, as required, Portland Cement matrix for terrazzo.

04 Marble Chips. Standard quarry products generally fine grain. Colors and proportions as selected by Architect in sizes No. 1, 2, and 3.

05 Water. Potable

06 Reinforcing. Galvanized welded wire mesh, 2" x 2", 16-gauge ASTM A-185.

07 Division strips. 1/8" "Heavy Top" type 1-1/4" white alloy zinc, manufacturer as approved by Architect. Locations as shown or directed, maximum at 5’ O.C.

08 Control Joints strip. 1/8", 1-1/2" white alloy zinc, manufacturer as approved by Architect. Locations as shown or directed.

09 Curing material. Liquid membrane, non-staining paper, polyethylene or clean water (ASTM-C-309).

10 Neutral cleaner. A neutral liquid cleaner prepared for the terrazzo trade.

11 Sealer. Penetrating type, free from harmful alkali or acid content. Sealer shall meet or exceed ASTM C1028 ratings of 0.77 for wet and 0.81 for dry conditions and specially prepared for terrazzo trade.

12 Isolation Membrane. 0.004" (4 mil) Polyethylene sheeting ASTM D2103 - Type 13300.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify the floor slab condition is acceptable for Terrazzo installation and report any discrepancies to the Architect.

3.2 APPLICATION

A. Terrazzo topping. Mix shall be 200 pounds of marble chips per 94 lb. of Portland Cement. Chips and cement to be identical to those used in approved sample. Color pigment, if used, shall be mixed in with dry ingredients. When thoroughly mixed, add 5 gallons of water per bag of cement.

B. Placing. Place 1/16" maximum uniform thickness dry sand in areas to receive terrazzo and install isolation membrane overlapping ends and edges a minimum of 3". Install reinforcement overlapping wire at edges and ends a minimum of 2 squares. Slush underbed with neat cement grout of same type specified for topping; broom into underbed surfaces. Where color pigments are required, add like portions to grout. Screed underbed 1/2" below finished floor elevation.

Place terrazzo topping in panels formed by divider strips; trowel to surface even with top of strips. Seed surfaces with same proportions and kinds of chips contained in topping. Trowel sprinkled chips uniformly over finish and roll with heavy rollers until all excess water has been extracted.

C. Curing. Shall be by material herein before specified. With due regard for weather conditions during curing process, installer shall determine time suitable for curing.

D. Finishing.

01 Grinding: The initial rubbing shall be accomplished by floor machines outfitted with No. 24, or finer, grit stones. A second rubbing, using No. 80, or finer, grit stones shall immediately follow initial rubbing.

02 Grouting: Immediately following rough grinding, surfaces shall be cleansed with sufficient water to remove dust and fines. Rinse thoroughly with clean water. Remove excess and apply paste consistency of cement grout of type employed in topping, by hand or machine, with pigment added in like amounts where called for in matrix; fill all voids.

03 Curing grout: As soon as grout has obtained initial set, cover entire surface with a generous application of specified curing material; allow to remain indefinitely to help protect finishes from staining until final polishing.

04 Fine stoning: Final machine rubbing shall not take place sooner than 3 days following grouting. The grouting shall be removed by means of floor machines using No. 80, or finer, grit stones. On completion of final rubbing, terrazzo finish shall show an average of not less than 70%-75% marble chips.

04. Four colors will be used in patterns as shown. Colors to be selected by Architect.

3.3 CLEANING & SEALING

A. Thoroughly wash all surfaces with a neutral cleaner after fine grinding.

B. Rinse with clean water and allow surface to dry thoroughly.

C. Apply sealer in accordance with sealer manufacturer's directions.

3.4 PROTECTION AND FINAL CLEANING

A. Upon completion of preliminary cleaning and sealing work, protect finished terrazzo floor areas until time of final cleaning and inspection.

B. Immediately prior to Owner's occupancy or final inspection, thoroughly scrub floor with neutral cleaner solution. Rinse surface thoroughly with clean water. When surface is thoroughly dry, apply one coat of sealer and buff to sheen with clean felt pad.

END OF SECTION

SECTION 09 6700
RESINUOUS FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Resinous Flooring and Cove Base.

B. Accessories necessary for a complete installation.

1.2 QUALITY ASSURANCE

A. Installer shall be a firm specializing in installing type of resinous flooring required for the project for three years, approved by coating system manufacturer and Architect.

B. Regulatory Requirements:
01 Building Code: Comply with applicable requirements of the IBC interior floors.
02 Meet requirements of ASTM D635, ASTM E648 or NFPA 253

C. Comply with applicable requirements of ADAAG and TAS 2012.

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Manufacturer's printed specifications and installation instructions.

C. Samples:
01 For initial selection of colors and profile, submit manufacturer's color charts and texture samples showing full range available.
02 For verification purposes, submit two 8" x 10" samples of resinous flooring applied to a rigid backing, in color and finish selected.

D. Maintenance Procedure: Flooring manufacturers recommended maintenance procedures.

E. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site missing errors. No on-site weighing or volumetric measurements allowed.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Stonhard “Stonshield Broadcast”

2.2 MATERIALS

A. Flooring System: 1/8th inch troweled epoxy mortar base with added decorative quartz broadcast. No slurries or simple broadcasts will be accepted. Overall system depth is 3/16th inch.

B. Primer: Equal to Stonhard Epoxy Primer, two component 100% solid squeegee applied and back rolled. One coat.

C. Mortar Base: Epoxy Resin, three (3) component, 100% solids. Metal troweled, Nominal 1/8" thick, one coat.

D. Undercoat: Epoxy resin, two (2) component, 100% solids, UV stable. Clear and gloss finish. One coat.

E. Aggregate: Quartz aggregate, pigmented standard finish. One coat.

F. Sealer: equal to Stonkote CE4, epoxy resin. Two (2) component, 100% solids, UV stable, clear, gloss finish. One coat. Texture level as selected by Owner/Architect.

G. Joint Sealant: type recommended by resinous flooring manufacturer.

H. Metal Control Joint: Zinc alloy, 14-gauge as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive resinous flooring, to ensure that slab does not deviate from allowable level tolerances, and that there are no structural cracks. Report unsatisfactory surfaces to Architect. Beginning of work constitutes acceptance of subfloor.

3.2 PREPARATION

A. Clean and prepare subfloor in accordance with manufacturer's printed instructions.

3.3 INSTALLATION

A. Secure stop and divider strips to subfloor at construction joints and other locations to comply with resinous flooring manufacturer's written instructions.

B. Apply prime/waterproofing membrane over entire substrate surface in manufacturer's recommended thickness. Where indicated, apply to integral cove base substrates.

C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions with metal top cap, including those for taping, mixing, priming, troweling, sanding and topcoating of cove base. Do not broadcast into cove. Mix quartz aggregates and add thixotropic and hand trowel. Provide 3/8 inch radius at floor/base transition, internal and external corners. Cove Base height as shown on drawings.

D. Trowel HRI Base to $1/8^{th}$ inch then apply Stonshield undercoat to floor.

E. Quartz Granules: Broadcast Quartz into undercoat. Scrape off and vacuum up excess aggregate.

F. Topcoats: Trowel or squeegee apply clear epoxy resin topcoats at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

G. Treat vertical and horizontal contraction and expansion joints by installing backer rod and sealant after coating installation is complete.

H. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.

I. Cure flooring system in accordance with manufacturer's written instructions.

3.4 CLEANING

A. Immediately prior to Owner's occupancy or final inspection, thoroughly scrub floor with neutral cleaner solution. Rinse surface thoroughly with clean water.

END OF SECTION

SECTION 09 6800

CARPET

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Carpet and accessories required for complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop drawings to the Architect showing layout of all seams and cross seams and location and type of carpet accessories.

C. Certificate showing manufacturer's loom on which carpet will be produced and date of last inspection for specification tolerances.

D. Samples showing manufacturer's full range of colors (12" x 12"). Actual base and accessory samples.

E. Actual sample from loom to produce run of carpet.

F. Manufacturers product data, including base adhesive.

G. Maintenance instructions.

H. Letter from manufacturer stating that the installer is approved by the manufacturer to install their product.

1.3 WARRANTY

A. Manufacturer shall warrant the carpeting for 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 70ºF at 20% RH for the life of the carpeting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tyoe “A”- Tandus Centiva Syllabus 10965 Color: Blue Spirit 76506

a.	Construction:	Patterned Loop
b.	Format/Width:	Rolled 6 feet
c.	Gauge:	5/64
d.	Pile Height Average	0.187”
f.	Fiber System:	Antron Lumena Nylon
g.	Dye Method:	100% Solution Dyed
h.	Primary Backing:	Synthetic Non-Woven
i.	Secondary Backing:	Powerbond, fusion coat backing

A. Type “B”- Tandus Centiva, "Abrasive Action II 02578” Color #19100 Charcoal

a.	Construction:	Accuweave Patterned Loop
b.	Width:	6 feet
c.	Gauge:	5/64
d.	Stich per Inch:	8
e.	Dye Method:	Solution Dye
f.	Primary Backing:	Sythethic
f.	Secondary Backing:	Powerbond, fusion coat backing

B. Accessories and Adhesive

01 Carpet edge shall be vinyl overlap type for glue down carpet in color selected by the Owner.

02 Accessories: Provide metal strips, thresholds, gripper edges, and other accessories of standard quality as recommended by the manufacturer.

03 Adhesive as recommended by carpet manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Deliver carpet to the job site in original mill wrappings, if full rolls. Store carpet raised above floor, under cover, in well ventilated spaces as soon as delivered. Protect carpet from damage, dirt, stains, and moisture.

B. The floor shall be clean and free of any foreign substances, such as wax, paint, oil, etc.

C. Cracks and holes shall be filled with latex emulsion filler compatible with adhesive. In any areas where transition from tile to concrete floor occur, and carpet is to be installed over the vinyl composition tile, also provide with Latex Emulsion Filler in areas where new carpeting is installed. Field verify such existing conditions.

D. Any ridges and high spots in concrete surface shall be ground smooth and level to prevent excessive wear.

E. Installer shall inspect and approve condition of subfloor prior to installation of carpet.

F. Field verify all dimensions prior to installation.

3.2 INSTALLATION

A. The following described required installation system is "The Roberts Method" for direct glue-down of carpet. Installers desiring to deviate from this described installation procedure shall outline in detail the proposed changes during the submittal period.

B. The floor must be free of any foreign substances (wax, oils, paint, etc.). Defects in subfloor, including cracks, holes, trowel marks or other irregularities which may be telegraphed to the surface of the carpet are to be called to the attention of the Architect prior to carpet installation.

Once carpet is installed any corrective work of subfloor surface irregularities become the responsibility of the carpet installer.

C. Concrete floors shall be tested for moisture by the carpet subcontractor. The General Contractor shall observe these tests. A test can be made by sealing a solid rubber or plastic mat to the concrete floor for 24 to 48 hours. If drops of moisture can be seen when it is removed, excessive moisture exists.

D. Sweep or vacuum the floor to assure uniform spreading of carpet adhesive on concrete. Lay out the room and snap a chalkline on the exact location of the first seam.

E. Cut each breadth long to permit it to turn up the walls at least 1" on all sides and ends to provide for easier trim. Be sure to hold carpet cutter in a vertical position to cut between the rows of the pile when the selvage for a seam is removed in order to prevent under-cutting of the backing. When rows of pile are not straight, or if pile is woven in a zig-zag pattern, snap a chalkline on edge of carpet and use a steel straight edge as a guide for the knife.

F. Align first breadth of carpet accurately along chalkline and put balance of breadths into place. Carefully check all seams to make sure that there is no shading between breadths and all of the pile is the same height. Turn back all of the breadths halfway and use a pencil to mark the location of each seam. Be sure that none of the breadths shift their position on the floor.

G. Use a notched trowel to spread carpet adhesive on floor area to be covered by first breadth of carpet. Care shall be taken to renotch trowels periodically to compensate for wear. Do not spread adhesive beyond guidelines. In large areas of very dry porous flooring, it may be necessary to lightly mop floor with a mixture of 1 tablespoon of ammonia to a pail of water before spreading with adhesive.

H. Unroll first breadth into adhesive. It may be necessary to use a knee kicker to adjust carpet to chalkline. Spread adhesive for second breadth and apply a bead of seam cement to carpet backing on first breadth. Do not spread adhesive beyond pencil mark guideline, as it may start to harden before next breadth is laid into place and create a high seam. Apply seam cement in a manner to seal loose fiber ends and prevent raveling.

I. Unroll second breadth into carpet adhesive and fit seam. Use a fairly stiff push broom to sweep trapped air toward edges of newly laid carpet. Do not use a linoleum roller or other heavy roller which could possibly stretch carpet and leave an open seam. Check the seam to make sure that pile on both breadths is the same height. Use seam solvent on a scrap of carpet to clean carpet before seam cement has hardened.

J. Carpet shall be fitted to all vertical surfaces before carpet adhesive is dry. Irregular surfaces such as doorways, pipes or columns should be fitted first. Use a very sharp razor blade knife for this purpose. The carpet contractor shall cut around all floor electrical outlets.

K. Use a carpet stair tool to crease carpet into junction of floor and straight walls. Fit carpet into junction of floor and straight walls. Fit carpet to straight walls with a wall trimmer and smooth face of carpet at wall with back of carpet knife.

L. When a cross seam is necessary and the weave of the carpet will not permit it to be cut on the pile line, the seam must be double cut. Carpet should first be installed in all areas surrounding the cross seam, but do not spread carpet adhesive under cross seam. Use a steel straight edge to guide a razor blade knife and cut through both thicknesses of carpet at one time. Open seam and spread carpet adhesive on exposed floor. Apply rubber seam cement to all exposed seam and lay carpet into place. Tuck corners in to assure a good fit and adjust seam for uniform appearance.

M. Where carpet is tucked into vinyl edge strip, edging must have seam sealer applied to edge of carpet where inserted into carpet reducer.

N. Trim loose nap edges with napping shears.

O. Leave completed carpet work in neat, uniform condition, vacuumed, cleaned and ready for use. Carpet contractor shall repair all damage done by him or his workmen.

3.3 CLEAN-UP

A. Thoroughly clean all carpet surfaces prior to final acceptance of carpeted areas by Owner. Leave work in neat, uniform condition, vacuumed and ready for use.

B. Any spillage of adhesive on face of carpet shall be removed immediately with a clean-up solvent recommended by the manufacturer.

C. Avoid traffic for at least twelve hours after installation.

D. Carpet contractor shall repair any and all damage done by his workmen.

E. Provide traffic areas with heavy Kraft paper or "Visqueen" to protect against damage and soiling. Provide such protection when directed by the Owner/Architect.

3.4 GUARANTEE

A. 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 year from date of substantial completion.

END OF SECTION

SECTION 09 8400

ACOUSTICAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Acoustical Wall Panels.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's technical data and installation instructions.

C. Shop Drawings. Show panel joints, detail references, dimensions and methods of attachment.

D. Color Samples. Showing manufacturer's full range of colors for selections.

1.3 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.

1.4 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 WALL PANELS

A. Core Composition. Fiberglass (7 lb/ft^3 density) with beveled hard edges. 2” thick. Sizes as shown or as requied.

B. Fabric Facing. 75% modacrylic polyester 23 oz. per linear yard minimum. Maximum of wo different colors for each school will be selected by Architect.

C. NRC. 0.70 Minimum.

D. Fire Resistance. Class A ASTM E-84.

E. Accessories. Provide factory installed concealed mounting hardware and accessories as recommended by manufacturer.

2.4 ACCEPTABLE MANUFACTURERS

A. Acoustical Wall Panels
   01 Acoustical Resources
   02 Conwed Designscope
   03 MBI Products

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify dimensions to insure proper fabrication of materials.

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.

C. Arrange wall panels symmetrically on each wall, unless otherwise indicated. Layout so that no panel is less than one-half the width of the typical panel, unless otherwise shown on drawings.

D. Remove and replace panels which are damaged and unacceptable to Architect.

END OF SECTION

SECTION 09 9000

PAINTING AND STAINING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work under this section includes furnishing all labor, material, equipment and accessories necessary for completion of all painting and staining, refer to paragraph 3.01 for list of items to receive paint.

B. Except as otherwise specified or noted, do not paint the following:
   01 Acoustic ceiling board
   02 Aluminum
   03 Chain Link Fencing
   04 Chalkboard and Trim
   05 Concealed Structural Steel & Joists
   06 Copper (except as exposed piping)
   07 Finish hardware, except hinges
   08 Light fixtures and coverplates
   09 Stainless steel
   10 Prefinished Metal Panels
   11 Plastic laminate (except glazing stops at plastic laminate doors requiring finish by this Section).

C. Following items are factory finished. Except as otherwise specified or noted. No painting is required.
   01 Grilles, registers and diffusers, unless otherwise noted.

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Material lists. Give the supplier's name, product name, number and generic description of each proposed product and its use. Provide product data sheets if so requested.

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. Installed Samples. Provide large size samples for approval. Approved samples may be left in place as part of the work.

E. One room and/or area, as selected by the Architect, shall be painted with materials specified or accepted and applied directly from container, unthinned. After acceptance by Architect, room and/or area shall be standard of quality of entire project.

F. Certification. Furnish a letter certifying that materials submitted are truly equivalent or better than those called out in the finish schedule. All paint must be low V.O.C.

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. If number of coats specified fails to produce a finish acceptable to Architect, this Contractor shall apply additional coat or coats at his own expense until an acceptable finish is achieved.

D. Provide primers and other undercoat paints produced by same manufacturer as finish coats. Use thinners recommended by paint manufacturer's printed instructions.

E. Deliver products to jobsite in unbroken containers bearing manufacturer's labels intact and legible at time of use.

F. Employ only skilled mechanics.

1.5 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.

1.6 PRODUCT HANDLING

A. Store only approved materials at the jobsite, and store 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-base 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. 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 WARRANTY

A. The undertaking of a painting subcontract will indicate that the subcontractor will warrant the work specified herein for two 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 Discoloring noticeably by yellowing, streaking, blooming, changing color or darkening

02 Mildewing
03 Peeling, cracking, blistering, alligatoring or releasing from the substrate
04 Chalking or dusting excessively
05 Changing sheen in irregular fashion
06 Softening or becoming tacky
07 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.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All paint materials 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 Co. and require no further approval as to manufacturer or catalogue number.

C. Similar firstline 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:

PPG Industries	ICI
Benjamin Moore Co.	Glidden Coatings & Resins
Olympic Stain	Samuel Cabot, Inc.
Pratt & Lambert	Monarch Paint Co.
Kelly-Moore	:

2.2 MATERIALS

A. The following is a specification of typical painted items and does not specifically include every item that is to receive paint but should establish type and quality of finish for all items normally included in a complete paint job.

B. Galvanized Metal (Interior and Exterior)
01 1 coat – B66W01310- Pro Industrial Pro-Cry Universal Acrylic Primer
02 2 coats- B66W01151- Pro Industrial DTM Acrylic Semi-Gloss

C. Ferrous Metals
01 1 coat – B66W01310- Pro Industrial Pro-Cry Universal Acrylic Primer
02 2 coats – B66W01051- Pro Industrial DTM Acrylic Semi-Gloss

D. Interior Gypsum Board and Plaster – Paint
01 1 coat – B28W6601 High Build Interior Latex Primer
02 2 coats – ProMar 200 Zero VOC Interior Latex Semi-Gloss
03 Use at all plaster, gypsum drywall and ceilings not scheduled to receive epoxy paint.

E. Interior Gypsum Board – Epoxy Finish
01 1 coat – B28W02600 ProMar 200 Zero VOC Interior Latex Primer
02 2 coats – K46W01151 Pro Industrial Pre-Catalyzed Water Base Epoxy Semi-Gloss

F. Interior wood - Paint
01 1 coat – Premier Wall & Wood Primer
02 2 coats – ProClassic Waterborne Interior Acrylic Semi-Glass Enamel

G. Interior Wood- Stained
   01 715100000 Miniwax Performance Series Tintable Wood Stain
   02 2 coats- 071029000 Minwax Fast Drying Polyurethane Semi-Gloss

G. Interior CMU-Paint
   01 1 coat- B42W00150 Pro Industrial Heavy Duty Block Filler
   02 2 coats –K46W01151 Pro Industrial Pre-Catalyzed Water-based Catalyzed Epoxy Semi-Gloss

H. Interior CMU – Epoxy Finish
   01 1 coat – Master Fill BlockFiller, B42W46
   02 2 coats-– Waterbased Epoxy Semi-Gloss, B70-200 Series

I. Shop Primed Metal, including hollow metal frames and doors – paint
   01 1 coat – B66W01310 Pro Industrial Pro-Cry Universal Acrylic Primer, B66A50
   02 2 coats – B66W01051 Pro Industrial DTM Acrylic Gloss

J. Pavement (Parking Lines)
   01 1 coat – Yellow 8000-1265 at Bus Parking & HC parking/route
   02 1 coat – White 8000-1266 at car parking.

2.3 COLORS

A. Colors shall be as selected by Architect.

PART 3 - EXECUTION

3.1 ITEMS TO RECEIVE PAINT

A. Generally, all interior and exterior surfaces exposed to view in the work at any area shall be painted. This shall include mechanical rooms, closets, storage rooms, and like areas unless specifically indicated to be left unpainted.

B. Include painting of all exposed, bare, and covered conduits, pipes and ducts (excluding color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work.

C. All work where a coat of material has been applied must be inspected and approved by Architect before application of succeeding specified coat, otherwise no credit for coat applied will be given. Notify Architect when a particular coat has been completed for inspection and approval. Apply coats of material in strict accordance with manufacturer's specifications except where requirements of these specifications are in excess of manufacturer's requirements.

D. Re-prime all preprimed items, including hollow metal doors/frames, as specified unless the supplier provides documentation that the shop primer material is equal to the specified primer and compatible with the specified finish coat.

3.2 PREPARATION

A. Notify Aldine I.S.D. of any surface not in proper condition to be finished before proceeding with the work. Starting work will constitute the painter’s acceptance of preceding work and conditions under which finish will be applied and his assumption of responsibility for results to be obtained.

B. Surface must be clean to insure 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. Wall surfaces must be dry before painting. Verify with moisture meter.

D. Finished Woodwork: Remove all dirt, stains, grade marks from surfaces to receive transparent finishes. Sand all surfaces to receive finishes smooth and dry brush clean. Wash knots and pitch pockets with mineral spirits, then seal with appropriate sealer. After first coat of primer or stain, neatly putty nail holes and cracks flush with adjoining surfaces. Apply paste wood filler on open grain woods. Wipe when set to obtain smooth, even appearance. Prime millwork, tops and bottoms of doors immediately upon arrival at job site.

E. Zinc Alloy or Galvanized Metal Work: Clean with solvent or use commercial pre-treatment solution as directed by manufacturer's instructions.

F. Shop-coated Metal Work: Remove all foreign matter and clean thoroughly. Abraded areas shall be spot-primed with the proper primer.

G. Ferrous Metal Work: Clean metal surfaces not provided with prime coat by others of rust, mill-scale, grease and foreign matter.

H. Drywall Surfaces: Ensure that surfaces are taped, cemented and sanded, ready to receive paint. Correct minor surface defects. Dust and clean surfaces before painting.

I. Concrete Surfaces: Clean surfaces of all foreign matter. Repair all minor defects with suitable patching material. Test paint-receiving surfaces for presence of alkali. If alkali is present, then neutralize with suitable neutralizing compounds.

J. Back-priming: Back-prime wood trim and other woodwork installed against steel, concrete or plaster with one coat of primer specified for that exposed surface.

3.3 APPLICATION

A. Paint Thickness: Provide the following minimum dry film thickness per coat unless noted otherwise:

01 Enamels on Metal: 1 mil
02 Latex Paints: 1 mil
03 Metal Primers: 1.5 mils
04 Undercoats: 1.5 mils
05 Traffic Lines: 2.5 mils
06 Epoxy Coating: 2.0 mils

Thickness test: Use observation gauge that measures "V" shape scratch.

B. Allow exterior paints to dry 72 hours between coats and interior paint to dry 24 hours between coats.

C. Perform all work under favorable weather conditions.

D. Backpaint all interior wood finish concealed surfaces.

E. Refer to the Drawings for location of various finishes.

F. Best workmanship will be required with all materials evenly spread and smoothly flowed on without bubbles, dust, runs, streaks, sags, brush or roller marks, unfinished patches and other blemishes. Finished work shall be uniform in color, texture, and sheen.

G. Neatness: Paint shall not be smeared, splattered, or run over adjoining colors or materials. Cut –in lines shall be straight.

H. First coat shall be white, unless otherwise specified.

I. Number of coats specified for paint, stain or block filler are minimum required under optimum conditions. Where additional coats are required for color coverage, filling of pinholes, smoothness or uniformity, the painting contractor shall be responsible for applying additional coats of material at no additional cost to the Owner.

J. All work where a coat of material has been applied must be inspected and accepted by the Owner or the Architect before application of succeeding specified coat; otherwise no credit for coat applied will be given. Notify Architect/Owner when a particular coat has been completed for review and acceptance.

K. Apply coats of material in strict accordance with manufacturer's specifications, except where requirements of the Contract Documents are in excess of manufacturer's requirements.

L. Painter's Option: Painter may remove all hardware other than butts and door closers prior to finishing doors and replacing same; or the painter may mask them with heavy paper and tape. Tape shall not be stuck to hardware, but shall be used to hold paper in place. Failure to do either will require hardware to be replaced; or require hardware to be removed and returned to manufacturer for reapplication of special baked lacquer protective cover at the paint contractor's expense. If left in place, plated butts shall be protected as mentioned above.

3.4 EXTRA STOCK

A. Upon substantial completion of the project, deliver to the Owner, an extra 1 gallon of each color, type, and gloss of paint used in the work, tightly sealing each container and clearly labeling contents and location where used.

END OF SECTION

SECTION 10100

MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES;

A. Adjustable Changing Table

B. Computer Work Bench

C. Access Control Traffic Pedestal

D. Splash Block

E. Book Truck

F. Gun Safe

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's specifications and installation instructions.

C. Shop Drawings. Show sizes, locations and installation details.

PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. Adjustable Changing Table: Equal to Pressalit Care 3000, Model #R8534. Table 55.5" length, 31" width, with 3-piece removable polyurethane foam mattress and safety rail. Adjustable from 12" to 38 7/8". Heavy duty aluminum frame for 440 lb. capacity, pneumatic counter balance. Provide 8' power core, transformer, stainless steel mounting brackets and anchor bolts.

B. Work Bench: Equal to Kendall Howard 72" Performance Workbench with 2-16" deep upper shelves and one 14" deep lower shelf and cable management channel.

C. Access Control Traffic Pedestals
01 Equal to All Security Equipment Dual Height Pedestal with Base Cover.
02 Material: 6063 aluminum with black powder coated finish.
03 Size: 2"x 2" x.125" aluminum square tube.
04 Horizontal projection shall be minimum 10".
05 Base Plate: 5"x7" x ¼". Suitable for surface mounting on concrete surfaces.
06 Provide base plate cover.
07 Pedestal Heights:42" and 72".
08 Face Plate Size: minimum 4"x4".

D. Splash Block

01 Pre-cast Concrete with 6”x6” #6-welded wire mech. 1’-6”x2’-6”.
02 One at each gutter.

E. Book Truck
01 Equal to Tesco #4445-000-000 Depressible Book Truck. 27” W x 26 ¾” Hx 22”D, constructed of 7-ply ¾” oak veneer with solid oak edge bands. Provide a 7-ply plywood depressible bool shelf with a lift mechanism. (2)3” fixed casters and (2)3” swivel caters.

F. Gun Safe
01 Equal to Stack-on Siege 12-gun fireproof with electronic lock gun safe. Color: black
02 Location: Officer’s Office.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install at locations and heights as shown and in accordance with manufacturer’s printed instructions.

B. Adjust for proper operation.

END OF SECTION

SECTION 10 1100

VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Markerboards, tackboards, tack strips and accessories necessary for installation.
B. Horizontal Sliding markerboards, tracks and accessories necessary for installation.
C. Markers as specified.
D. Tackable Surfaces
E. Display Cases

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's specifications and installation instructions.

C. Shop Drawings. Show locations and trim details.

D. Samples. Samples or color charts showing manufacturer's full range of colors for Architect's selections.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Markerboards.
   01 1/2 inch thick; three components, 24-gauge porcelain enameled on steel face, 7/16 inch MDF core and .015 aluminum sheet backing.
   02 Similar to Claridge "LCS" liquid chalk writing system,
   03 Color: White.
   04 Factory built units.

B. Tackboards.
   01 Claridge “Fabricork Series No. 1550 EW” or equivalent; vinyl fabric on 7/32 inch cork on ¼ inch hardboard with wrapped edges.
   02 Provide metal frame to match markerboards at all sides.
   03 Color: Selected by Architects
   04 Factory built units.
   05 ASTM E84, Class A rating for vinyl fabric.
   06 For ¼” tackboards, use “Fabricork 1500,” edge with #279 cap strip at all sides.

C Tack Strips.
   01 Similar to 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 Locations: on walls where noted on drawings.

D. Horizontal Sliding Markerboard

01 Claridge rail system with closed end frames.
02 Fixed Back Panel with one Sliding Panel: LCS porcelain enamel steel markerboard.
03 Finish back of sliding markerboard panel with 24 gauge porcelain enameled finish.
04 Provide roller and guide assembly and all accessories required for a complete installation.
05 Provide a minimum 3/8" clearance from back of frame to any markerboard as required to clear window frame.
06 Provide Marker tray.

F. Display Case
01 Complete case construction for interior use. Basis of Design: Claridge Model 399
02 Recessed. Dimensions as shown on drawings.
03 Sliding Doors: aluminum sliding doors with locks; ¼" tempered glass.
04 Finish: clear anodized aluminum.
05 Lighting: Fluorescent at top.
06 Shelving: Polished plate glass with polished edges. Three per section.
07 Shelve Standards: Overlapping the background "T", Type "A" with regular brackets.
08 Background: "Fabricord" Tackboard, color as selected.

C. Trim and Accessories.
01 Perimeter Trim
a. Heavy gauge extruded aluminum; Claridge "Series 1" or equivalent
b. Corners. Square and mitered with reinforced corner "L" insert.
c. Joints. Hairline joints with adjacent surfaces flush with each other.
d. Metal burrs or exposed sharp edges are not acceptable.
e. Provide end caps for chalk troughs.
f. Finish. Clear anodized aluminum.
02 Map Rail.
a. At top of every markerboard.
b. Cork insert covered with fabric matching tackboard fabric.
c. Claridge "No. 74 Deluxe Map and Display Rail" or equivalent.
d. End stops: Claridge " No. 75ES" or equivalent.
e. Flag holders: 2 per room; Claridge " No. 76FH" or equivalent.

03 Adhesive
a. As recommended in writing by the board manufacturer.
b. For use in board installation on masonry partitions. Do not use in board installation on drywall partitions.

2.2 ACCEPTABLE MANUFACTURERS

A. Claridge Products and Equipment, Inc.

B. Best-Rite.

C. Greensteel

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions. Rigidly anchored to backup materials. Set without mastic on all partitions.

B. Coordinate with window frame for installation of sliding markeroard.

C. Provide all grounds, brackets, anchors, trim, and accessories for a complete installation.

D. Install trim plumb with joints closely fitted and corners mitered. Secure trim with fasteners spaced 16 inches on centers maximum. Provide molley bolts on all walls.

G. Verify mounting heights with Architect prior to installation.

H.

I. Provide 12 markers for each marker board (3 each black, red, blue and green).

END OF SECTION

SECTION 10 1400

GRAPHICS

PART 1 -GENERAL

1.1 SECTION INCLUDES

A. Furnish and install the following:
- 01 Dedication Plaque.
- 02 Traffic signs.
- 03 Exterior illuminated Aluminum Letters
- 04 Interior Signage

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings: Show sizes, finishes, construction details, mounting heights and installation instructions.

C. Show message list, typestyles including raised characters and Braille.

1.3 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.

PART 2 – PRODUCTS

2.1 DEDICATION PLAQUE

A. Provide one (1) cast aluminum dedication plaque. Tablet size to be approximately 24”w x 18” L x ¾” thick with modern border design faces to be raised letters with satin finish. Background finish to be determined. Sign shall be permanently anchored to wall. Final text and letter style to be furnished by the Architect with Contractor to furnish Architect with rubbing of actual pattern for approval prior to casting.

2.2 TRAFFIC SIGNS

A. Substrate (sign Blanks). This shall be minimum 0.125” aluminum alloy 5052-H38 and otherwise in conformance with ASTM B209 and have gold chromate finish.
- 01 the type of signs are shown on the drawings.
- 02 Size. The dimensions of substrate applications for regulatory, warning and guide signs shall be in accordance with the Standard Highway Sign Designs for Texas and with the Texas Manual of Uniform Traffic Control Devices for residential areas.
- 03 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.
- 04 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.
- 05 The aluminum shall be new and corrosion-free with holes drilled or punched; corners rounded to the radii as shown, and all edges smoothed prior to application of sheeting.

06 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 he Standard Highway Sign Designs for Texas and with the Texas Manual of Uniform Traffic Control Devices.
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 blank shall be covered with appropriate retro-reflective sheeting.
03 All ground mounted stop sign, warning signs, and other regulator signs, shall use at a minimum High Intensity Prismatic Reflective Sheeting.

C. Sign Posts. 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 sign posts shall be either nominal 2" diameter or 2"x2" square pipe.
03 Provide caps at all posts.
04 ADA Handicap Parking signs located within parking lots shall be mounted on 2"x12"x1/4" structural rectangular tubes with welded ¼" cap plate. Finish shall be painted as directed by the Architect.
05 All sign posts shall be hot-dipped galvanized.
06 Provide in length required for industry standard mounting height plus a minimum of 18" to be embedded in a minimum 12" diameter x 24" concrete footing.

D. 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.

2.3 EXTERIOR ILLUMINATED ALUMINUM LETTERS

A. Material: Aluminum 319 Alloy.

B. Edge: Square.

C. Finish: powder coat paint in color selected by the Architect from manufacturer's full range of color selections.

D. Letters: Reverse Channel Illuminated, size and case as shown on drawings.

E. Mounting: provide mounting brackets, fasteners recommended by manufacturer, mount on surfaces where shown.

2.4 INTERIOR ROOM SIGNS

A. High pressure laminate sheet, laminated to a 1/8" inch thick acrylic back with square corners with square-cut edges painted.

B. Room Numbers, Symbols and Restroom Copy: Matte finished acrylic, raised 1/32 inch, of color shown. Chemically weld characters and pictograms to the acrylic backing, through the face laminate, to assure permanent adhesion. Each sign shall be accompanied by Grade II braille by means of "VisiTouch Duradot System". Glass or metallic "Durodots" shall have 0.059 inch

surface diameter with body of sphere pressure secured below face laminate. Routed boxes or glued on dots are not acceptable.

C. Restroom Pictograms: Position on a minimum six inch square, unobstructed field.

D. Fasteners: 1/8 inch thick double-sided foam tape of type recommended to suit application and commercial grade silicone sealant.

2.2 INTERIOR SIGNAGE SCHEDULE

Door Number	Sign Type	Sign Message	Remarks
A101	B	419	
A102	B	417	
A103	B	415	
A104	B	413	
A105	B	411	
A107	B	421	
A108	B	423	
A110	A	GIRLS	
A111	A	BOYS	
A112	B	420	Provide backer plate
A113	B	414	
A114	B	422	
A115	C	412/MECH/ELEC	
A115A	C	410/IDF	
A116	B	424	
A117	B	426	Provide backer plate
A118	C	408/STOR	
A119	A	BOYS	
A120	C	404/CUST.	
A121	A	GIRLS	
A122	A	STAFF (uni-sex symbole)	
A124	B	425	
A125A	B	427	
A125B	B	427	
A126A	B	429	
A126B	B	429	
A127	B	431	
A130	B	401	
A132	B	403	
A133	B	405	
A134	B	407	
A135	B	409	
A201	B	517	
A203	B	515	
A204	B	513	
A205	B	511	
A206	B	509	
A208	B	518	

Door Number	Sign Type	Sign Message	Remarks
A209	B	522	
A210A	B	516	
A210B	B	516	
A211	B	516A	Provide backer plate
A212	B	524	Provide backer plate
A214	A	BOYS	
A215	A	GIRLS	
A216	A	514	Provide backer plate
A217	A	512	
A218	C	510/MECH/ELEC	
A220	B	528	
A221	B	532	
A222	A	BOYS	
A223	B	GIRLS	
A224	C	504/CUST.	
A225	A	STAFF (with uni-sex symbol non-accessible)	
A226	C	502/IDF	
A227	A	STAFF (w/uni-sex symbol; accessible)	
A230	B	519	
A231	B	521	
A232	B	523	
A233	B	525	
A234	B	527	
A235	C	529/STOR.	
A236	B	531M	
B102A	B	330	
B102B	B	330	
B103A	B	328	
B103B	B	328	
B104A	C	326/LEARNING RESOURCE CENTER	
B105A	B	324	
B106A	B	322	
B107	B	304	
B108	C	306/IDF	
B109A	B	313	
B110A	C	313A/KILN	
B110B	C	313A/KILN	
B111A	C	314A/STOR	
B111B	C	314A/STOR	
B112	C	308/CUST.	
B113A	B	314	
B114	B	319	
B115	B	320	
B116	B	321	
B118	A	RESTROOM(w/uni-sex	

Door Number	Sign Type	Sign Message	Remarks
		symbol)	
B119	C	317/STOR	
B122	B	301	Provide backer plate
B123	C	305/MECH	
B123A	A	STAFF(w/uni-sex symbol)	
B124	C	307/ELEC.	
B125A	C	309/ELEC	
B125B	C	307/ELEC	
B126A	C	311/BOILER RM	
B126B	C	311/BOILER RM	
B127	C	202C/UTILITY	
B128	B	202B	
B129	C	202D/LOCKERS	
B130	A	RESTROOM (w.uni-sex symbol)	
B134	C	202A/STOR	
B136A	C	101/GENERAL OFFICE	
B136B	C	101/GENERAL OFFICE	
B137	A	RESTROOM (w/uni-sex symbol)	
B138A	C	102/CLINIC	
B139	B	102A	
B140	B	102B	
B141	A	RESTROOM (w/uni-sex symbol)	
B142	B	119	
B143	B	103	
B144	B	104	
B145	B	105	
B146	B	107	
B146A	C	109/IDF	
B147	C	117/MECH/ELEC	
B148	A	RESTROOM (w/uni-sex symbol, non-accessible)	
B149	A	RESTROOM (w/uni-sex symbol and accessible)	
B150	B	111	
B152	B	106	
B153	B	108	
B154	B	110	
B155	A	RESTROOM (unisex symbol)	
B156	C	112/CLOSET	
B157A	B	114	
B158	B	116	
B159	B	118	
B160	B	120	
B161	B	122	
B162	B	124	

Door Number	Sign Type	Sign Message	Remarks
B163	B	126	
C103	C	203/TEACHERS LOUNGE	
C104	A	BOYS	
C105	A	GIRLS	
C106A	B	209	
C106B	B	209	
C107A	A	RESTROOM(uni-sex)	
C107B	A	RESTROOM(uni-sex)	
C108A	B	211	
C108B	B	211	
C109A	B	213	
C109B	B	213	
C110A	A	RESTROOM(uni-sex)	
C110B	A	RESTROOM(uni-sex)	
C111A	B	215	
C111B	B	215	
C113A	B	214	
C113B	B	214	
C114A	A	RESTROOM (uni-sex)	
C114B	A	RESTROOM (uni-sex)	
C115A	B	212	
C115B	B	212	
C116A	B	210	
C116B	B	210	
C117A	A	RESTROOM (uni-sex)	
C117B	A	RESTROOM(uni-sex)	
C118A	B	216	
C118B	B	216	
C119A	B	218	
C119B	B	218	
C120	A	RESTROOM (uni-sex)	
C122	B	227	
C123A	C	115A/CHANGING RM	
C123B	C	115A/CHANGING RM	
C124A	A	RESTROOM(uni-sex)	
C124B	A	RESTROOM (uni-sex)	
C125A	B	225	
C125B	B	225	
C126A	B	223	
C128A	B	208	
C128B	B	208	
C129	A	RESTROOM (uni-sex)	
C130	C	108A/STOR	
C131	C	219/IDF	
C132	C	221/MECH/ELEC	
C133	C	206A/STOR.	
C135	B	206B	
C139B	C	206/P.E.	

Door Number	Sign Type	Sign Message	Remarks
C201	C	601/MECH	

2.3 MANUFACTURERS

A. Architectural Graphic Products
B. Sign International Inc.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install plastic laminate the Dedication Plaque with concealed mount on masonry wall at location as directed by Architect.

B. Install interior room signs with perimeter of foam tapes and center fill of clear silicone adhesive, locate on wall at strike side of door, 4” from jamb, 5’ above the floor, unless otherwise shown. Mount with a solid back-up plate of same color to cover reverse side on glass.

C. Install exterior aluminum letters in strict accordance with manufacturer’s installation instructions and recommendations specific to this installation.

D. Verify with Owner/Architect for specific location and height of the exterior letters prior to installation.

E. Install traffic signs in strict accordance with manufacturer’s installation instructions and mounted at standard regulatory heights.

END OF SECTION

SECTION 10 1900

CUBICLE CURTAINS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cubicle curtain track

B. Curtains

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   01 Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   02 Manufacturer's installation instructions.
   03 Samples of color charts showing manufacturer's full range of colors.

PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. Curtains and Curtain Track - provide one at each cot as shown.
   01 Provide ceiling-mounted, extruded aluminum continuous curtain track,, IFC-100 roller carrier, in clear anodized finish. Provide 48 inch baton for hand operation, and all slides and hardware for a complete installation. Provide on curtain track one curtain of 100% trivera polyester inherently flame resistant fabric with retardant 100% nylon ½" mesh drop at each cot room. Curtain shall be 10% wider than opening with flat panel, grommets at 6 inches on center, and 20 inches of open mesh at top. The bottom of the curtain shall be 6 inches above the finish floor.

B. Approved Manufacturers: Specifications are based on first name manufacturer. Other approved manufacturers must meet or exceed this standard.

C. Track:
   01 General Cubicle Co.
   02 Imperial Fastener Co.
   03 Watrous, Inc.,
   04 A.R. Nelson Co., Inc.

D. Curtain:
   01 General Cubicle Co.
   02 Imperial Fastener Co.
   03 Webb Manufacturing Co.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Adjust for proper operation.

END OF SECTION

SECTION 10 2114

SOLID POLYMER TOILET PARTITIONS

PART 1 - GENERAL

1.1 THIS SECION INCLUDES:

A. Solid polymer toilet partitions, urinal screens and accessories required for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Date. Manufacturer's specifications and installation instructions.

C. Shop Drawings:
   01 Show all required field measurements, details and elevations plans, and sections required to indicate all conditions.

D. Samples
   01 Samples or color charts showing manufacturer's full range of colors for Architect's selection.
   02 Samples of hardware to be used.

PART 2 – PRODUCTS

2.1 MATERIALS

A. All toilet partitions shall be floor mounted, overhead braced, solid polymer, and in the dimensions and arrangements indicated on the drawings.

B. Panels, Pilasters and Doors:
   01 Material shall be High Density Polyethylene (HDPE) resin with homogenous color throughout with ¼" radius edges. Class A – ASTM84
   02 Doors, stiles, pilasters, panels and seats of compartments shall have a finished thickness of 1 inch minimum, and shall have a uniform flush front appearance.
   03 Stiles shall have leveling device and be concealed by a one-piece 4 inch high, stainless steel shoe.
   04 Height: 69 inch partitions set 14 inches above finish floor; pilasters and stiles shall be 82 inch with overhead rails. Brace back to rear or side walls.

C. Finish:
   01 Surface of toilet compartments shall be solid 1 inch thick High Density Polyethylene (HDPE) resin with matte finish. Color as selected by Architects.

D. Hardware:
   01 All door hardware, mounting brackets and support brackets for seats shall be type 304 satin finish stainless steel, Provide approved through-bolted vandal proof fasteners.
   02 Head rails and head rail returns of overhead braced toilet compartments shall be stainless steel, locate above all doors and panels. Anti-grip profile.
   03 Continuous metal brackets and angles for support of all panels.
   04 All shoes for panels shall be stainless steel.
   05 Hinges shall be S.S. continuous piano hinge.
   06 Locked compartment may be opened from outside, using the emergency access latch.
   07 All exposed screws to be tamperproof, stainless-steel fasteners.
   08 Provide pulls and coat hook for each stall.

2.2 MANUFACTURERS

A. Partitions:
   01 ASI Accurate Partitions Corp.
   02 Bobrick
   03 Scranton Products
   04 API

B. Hardware: Stainless Steel

PART 1 - 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.

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 2226

FOLDING GLASS PARTITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Operable glass panel partitions.

B. Suspended track system and accessories necessary for complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data and Shop Drawings
   01 Include plans, elevations, details, panel layout and attachments to other work.
   02 Include field verified dimension, clearances and existing conditions.

C. Manufacturer's installation instructions.

D. Samples or color charts showing manufacturer's full range of colors.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. ASTM ES57

C. STC per ASTM E90-99 and E413-87.

D. ADA

E. ANSI Z97.1 and CPSC 16 CFR 1201- Gazing Safety

1.4 WARRANTY

A. Guarantee the partition panels for a period of two years from date of Substantial Completion.

B. Guarantee the suspension system for a period of five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product: Equal to ModernFold Acousti-Clear Automatic.

B. Paired Panel- manually operated and manually activated paired panel operable partition. Panels hinges in groups of three or more are not acceptable.

C. Suspension system:

   01 Suspended Track: Minimum 11 gauge 0.12" roll-formed steel track suitable for direct mounting to a wood header or supported by adjustable steel hanger brackets supporting the load-bearing surface of the track connected to structural support by pairs of 1/8" diameter threaded steel rods. Aluminum track is not acceptable.
   02 Carriers: One stainless steel trolly per panel. Non-steel wheeled trolleys are not acceptable.

D. Panel Construction:

01. Glass Panels

02. Nominal 4" thick panels in manufacturer's standard 48" width. All panels horizontal and vertical framing members shall be fabricated from aluminum extrusions and mechanically fastened.

03 Panel Faces

a. 5/16"clear glass on one side, mechanically fastened and sealed in frame.

b. 3/8" clear glass on one face, mechanically fastened and sealed in frame.

c. Glass type/Finish: Clear Tampered, comply with ASTM C1036, ASTM C1048, CPSC 16 CFR 1201 Categories 1 &1, and ANSI Z97.1.

04 Panel Trim: Pre-finished aluminum in clear-anodized.

05 Acoustical ratings of panels: minimum STC 51.

G. Sound Seals:

01 Vertical interlocking sound seals between panel: extruded aluminum astragals with interlocking convex/concave resilient quad-lip gaskets. Rigid plastic astragals or astragals with gaskets on only one panel edge are not acceptable.

02 Horizontal top and bottom seals shall be automatic operable seals providing 7/8" operating clearance with an operating range of 9/6" to 3/8". Seals shall operate automatically without tools or cranks and shall extend as panels are positioned. Fixed seals at top or bottom of panels are not acceptable.

H Operation:

01 Series of paired flat panels hinged together in pairs, manually operated, manually activated, top supported with automatic top and bottom seals.

02 Final Closure: Horizontally expanding panel edge with removable crank.

2.2 MANUFACTURERS

A. Modernfold, Inc.

B. Moderco

PART 3 - EXECUTION

3.1 INSTALLATION

A. Field verify existing dimensions, clearances and conditions.

B. Preparation of opening shall be by General Contractor.

C. Installation shall be by a local factory-authorized, factory-trained installer. Installation shall be in accordance with approved shop drawings, and in accordance with ASTM E-557.

D. Demonstrate proper operation and maintenance procedures to Owner's representative.

END OF SECTION

SECTION 10 2239

FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Electrically operated, continuous hinged acoustical panel partitions.

B. Suspended track system and accessories necessary for complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data and Shop Drawings
   01 Include plans, elevations, details, panel layout and attachments to other work.
   02 Include field verified dimension, clearances and existing conditions.

C. Manufacturer's installation instructions.

D. Samples or color charts showing manufacturer's full range of colors.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.4 WARRANTY

A. Manufacturer's two year warranty from date of Substantial Completion.

B. Manufacturer shall repair or replace failures include, but not limited to, the following:
   1. Faulty operation of operable panel partitions.
   2. Deterioration of metals, metal finishes and other materials beyond normal use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product: Shall be Modernfold "Acousti-Seal" Model 933E.

B. Operation: Shall be series of continuously hinged flat panels, electrically operated, top supported with operable floor seals. Partitions shall be operated by two push button control stations wired in series and located on opposite sides and opposite ends of the partition. Control stations shall be activated by key switch at stack end of partitions. Motor assembly shall have wiring compliant with NFPA 70, 24 volt controls, complaint with UL 508A, and speed of 28feet/minute, Equip the motor with outboard limit switches to prevent over-extension. A positive chain drive attached to the lead panel shall pull the partition across the opening. Cable, belt or other friction type drives will not be accepted.

C. Panel Construction: Shall be 3 inches thick by manufacturer's standard panel width (48 inches), and of all steel construction. Panel skins shall be roll-formed steel wrapped around the panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction.

D. Acoustical rating shall be 50 STC min. Weight of the panels shall be 8 pounds/square foot max.

D. Provide one pass door. Same thickness and appearance as panels. Provide full leaf butt hinges attached directly to the panel frame with welded hinge anchor plates, automatic door closure, self-illuminated exit signs and panic hardware.

F. Panel Finish: Shall be factory applied reinforced heavy-duty vinyl with woven backing weighing not less than 30 oz. per lineal yard.

G. Sound Seals:

01 Vertical seals between panel shall consist of roll-formed astragals, with reversible tongue and groove configuration in each panel edge. Horizontal top seals shall be continuous contract extruded vinyl bulb shape. Horizontal button seals shall provide 2" nominal operating clearance with an operating range of +1/2 to -1 ½" which automatically drop as panels are positioned, without the need for tools or cranks.

H. Suspension System: Shall be #14 Suspension System. Minimum 7-ga. Roll-formed steel. The track shall be supported by adjustable steel brackets connected to the structural support by two threaded rods. Brackets must support the load bearing surface of the track. Steel removable track soffit attached to track bracket without exposed fasteners and pre-painted in off-white. Carriers shall be all steel trolleys with steel-tired ball bearing wheels. Provide exposed track soffit attached to track bracket without exposed fasteners and pre-painted off-white.

I. Electric Operator: Shall consist of ***230v***, ***3-phase*** motor. Motor shall be located above the stack area, off center to the side of the track run. (Contractor is to field verify existing power prior to ordering of the product).

2.2 MANUFACTURERS

A. Modernfold, Inc.

B. Moderco

PART 3 - EXECUTION

3.1 INSTALLATION

A. Field verify existing dimensions, clearances and conditions.

B. Preparation of opening shall be by General Contractor.

B. Installation shall be by a local factory-authorized, factory-trained installer. Installation shall be in accordance with approved shop drawings, and in accordance with ASTM E-557.

END OF SECTION

SECTION 10 2810

TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Furnish and install toilet accessories as specified.

B. Install toilet accessories furnished by Owner as specified

C. Supplementary items necessary for installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's technical data and installation instructions.

1.4 QUALITY ASSURANCE

A. Furnish items from one manufacturer only unless otherwise specified.

B. Design, finish and keying of items shall be the same.

C. Install all accessories per applicable TAS Standards.

PART 2 – PRODUCTS

2.1 QUALITY STANDARDS

A. Grab Bars. Bobrick B-6806.99, or American Specialties, Inc., Model 3800, 1-1/2-inch diameter stainless steel, peened finish grab bars, lengths as shown. Bobrick B-6861.99 or equivalent at 36”x 36” shower stalls. Provide manufacturers concealed anchor devices for conditions encountered. Locations as shown on drawings.

B. Framed Mirror. Bobrick B-290, or American Specialties, Inc., Model 0600, Stainless steel channel frame with satin finish, theft resistant hangers, tempered glass mirror. Bobrick B293 Series at handicap locations. Size: 24”x36” unless otherwise shown.

C. Mop Holder. Bobrick B-223, or American Specialties, Inc., Model 8215, 36” inches long, satin-finish stainless steel. 4 anti-slip mop holders with spring loaded rubber cam. Provide one at each mop sink.

D. Toilet Tissue Paper Holder: Surface wall mounted. Furnished by Owner and installed by Contractor.

E. Paper Towel Dispenser: Surface wall mounted. Furnished by Owner and installed by Contractor.

F. Soap Dispenser: Surface wall-mounted. Furnished by Owner and installed by Contractor.

G. Baby Changing Station. Koala Kare KB 200-00 Horizontal baby changing station, wall mount. 35- 3/16” Wx4”Dx22 ¼”H, must meeting ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Deliver inserts and rough-in frames to jobsite at appropriate time for building-in as required. Provide templates and rough-in measurements as required.

B. Verify with Owner/Architect exact locations of all accessories.

3.2 INSTALLATION

A. Install items in accordance with manufacturer's printed instructions.

B. Install true, plumb and level, securely and rigidly anchored to substrate with through-bolts into wood blocking.

C. Use approved theft-resistant type fasteners.

END OF SECTION

SECTION 10 4313

DEFIBRILLATOR AND CABINETS (AED)

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

A. AED
B. Cabinet to receive AED.

1.2 SUBMITTALS

A. Comply with Section 01 3300.
B. Product Data: Manufacturer's specifications and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cabinets: Philips AED wall cabinet, semi-recessed, alarm, part #145SR3-1 or #PFE7023D
B. AED: Phillips HeartStart FRx AED, Part #861304 includes:
   01 8 Year Manufacturer's AED Device Warranty.
   02 Pair of Smart Pads II Adult Electrode Pads.
   03 Lithium Baterry (4 year warranty)
   04 Owner's Manual
   05 AED Inspection Decal
   06 Phillips FRx rugged carry case
   07 CPR Rescue Kit with Breathing Mask.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinet on walls and AED in cabinet at location as shown in accordance with manufacturer's printed instructions.

END OF SECTION

SECTION 10 4400

FIRE EXTINGUISHER AND CABINETS

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

A. Fire extinguishers.
B. Fire extinguisher cabinets.

1.2 SUBMITTALS

A. Comply with Section 01 3300.
B. Product Data: Manufacturer's specifications and installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cabinets:
   01 Larsen's Manufacturing Co.
   02 J. L. Industries - "Cosmopolitan" Series #1037-V10

B. Fire Extinguisher:
   01 Larsen's Manufacturing Co.
   02 J. L. Industries- Cosmic 10E

2.2 MATERIALS

A. Fire Extinguisher Cabinets:
   01 24" x 9 1/2" x 6" inside box dimension
   02 Semi-recessed type with 2 1/2 inch return trim rolled edge
   03 Stainless steel door with handle and silk-screened lettering "Fire Extinguisher" with double strength vertical glass
   04 Hinge: Concealed
   05 Provide a handle and roller 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. Fire Extinguishers (Standard):
   01 Multi-purpose dry chemical with UL 4A-60B:C and FM approved; UL 2A-10B:C for 5 lbs.
   02 Capacity: 5 lb. direct wall mounted extinguishers, provide eight, locations as directed; 10 lb. at fire extinguisher cabinets as shown on drawings.
   03 Provide initial inspection tag for each extinguisher.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fire extinguishers on walls and in cabinets at locations as shown in accordance with manufacturer's printed instructions.

END OF SECTION

SECTION 10 5113

LOCKERS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Metal lockers

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Manufacturer's technical data for material, fabrication and installation instructions.

C. Shop Drawings: Show locations of lockers and details of components of assembly, including numbering systems.

D. Samples: Submit color charts for Architect's selections.

PART 2 - PRODUCTS

2.2 MANUFACTURERS

A. List Industries, Inc.

B. Lyon Metal Products, Inc.

C. Medart, Inc.

D. Penco Products

E. Republic Storage Systems Co., Inc.

2.2 MATERIALS

A. Metal Lockers

01 Heavy duty "quiet" steel lockers
02 Doors and Door Frames. Cold-rolled and leveled sheet steel.
03 Other Parts. Mild cold-rolled steel.
04 Doors. 14-gauge steel, adequately flanged with formations consisting of two right angles at lock and hinge sides and one right angle top and bottom.
05 Door Frames. 16-gauge channel formation securely welded together. Form sides of frame to provide a continuous door strike, Provide 16-gauge channel frame member between upper and lower doors.
06 Locking Device. Provide recessed handle, stationary type with combination lock and pad lock hole.
07 Hinges. Provide continuous piano hinge.
08 Finish. Thoroughly clean each unit and 100 percent zinc/iron phosphate coat after fabrication. Coat with epoxy enamel, baked on. Bolts and nuts shall be zinc plated.
09 Ventilation. Doors shall be louvered for ventilation.
10 Number Plates. Provide an aluminum number plate with 3/8" black filled numbers for each locker riveted to locker. Number sequence as directed by Architect.
11 Locker Types. 12" wide x 12" deep x 72" high double tier, with sloped top. Provide one shelf, one single-prong wall hook on back and each side. Color as selected by Architect from Manufacturer's standards.
12 5% of each type of lockers shall be ADA compliance.

.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in location shown on drawings, in accordance with manufacturer's instructions, and approved shop drawings.

B. Anchor all lockers to the concrete base and wall, per manufacturer's recommendations.

END OF SECTION

SECTION 10 5613

INDUSTRIAL METAL SHELVING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Metal shelving units.

1.2 SUBMITTALS

A. Comply with Section 01 3300.
B. Shop Drawings:
   01 Indicate sizes and locations of all units.
   02 Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   03 Manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   01 Adjustable heavy duty open shelves.
   02 Height: 85"
   03 Shelf Capacity: 400 lbs. uniformly distributed load.
   04 Plan size as indicated on drawings.
B. Shelf Unit Components:
   01 Seven shelves
   02 Two pair side sway braces per unit.
   03 One pair back sway braces per unit.
C. Finish: Gray paint standard factory applied.

2.2 MANUFACTURERS

A. Republic Storage System
B. Penco
C. Inco Metal Products
D. Dixie Shelving Co.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install shelving units in accordance with manufacturer's printed instructions.
B. Secure wall units to walls.
C. Refer to drawings for locations.
D. Install bottom shelf 1'-0" above finish floor.

END OF SECTION

SECTION 10 7316

ALUMINUM WALKWAY COVER

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

A. Aluminum canopies.

B. Custom fit Aluminum Entry Cover

1.2 QUALITY ASSURANCE

A. Installation shall be made by walkway manufacturer or approved supplier.

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's technical data for materials and construction.

C. Shop Drawings. Show layout, fabrication details, materials, connections and erection details. Included load calculations sealed by a Texas Registered Engineer.

C. Certification. Provide registered Texas Structure Engineer's seal on shop drawings.

D. Permit: Apply permit and final approval from City of Houston if required,

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. AVAdek

B. Approved Equal.

2.2 MATERIALS

A. Extruded aluminum alloy 6063-T6, 6061-T6 and 6005-T5.

B. Finish
- 01 Extruded beams, columns and fascia, anodized clear aluminum finish
- 02 Deck: Polyester based enamel equal to PPG Polycron III.
- 03 Protect columns embedded in concrete with clear alkali-resistant clear acrylic

C. Construction
- 01 Structural Load Requirements. Aluminum frame, bracing rod and brackets shall be designed to support the following loads unless otherwise shown.
  - a. Live load 20 psf
  - b. Wind load 150 mph
  - c. Structure shall be in accordance with local and state building codes.

02 Drainage. Precipitation shall drain from canopy deck into beams, then through designated columns for discharge at ground level. In areas of heavy freezing, particular care should be employed in drainage system design to avoid possible structural damage to components. South Bus Drive and North Parent-pick-up canopies shall have underground drainage.

03 Bent Construction. Anodized beams and columns shall be factory welded, with neatly mitered corners into one-piece rigid bents. Welds shall be smooth and uniform using an inert gas shielded arc. Use suitable edge preparation to assure 100% penetration. Field welding is not permitted. Extruded structural ties shall be rigidly installed in beam tops also serving as closures between draining deck sections. Cut edges shall be true and smooth, free from excessive burrs or ragged edges. Due to shipping limitations, mechanical joints may be utilized when absolutely necessary.

04 Deck Construction. Deck shall be composed of extruded sections that interlock in a self-flashing manner, 2-3/4" No protruding ribs on the underside of deck.

05 Aluminum Soffit. Aluminum 6" wide with V-groove, 0.185" minimum thickness. Vent if needed,

05 Expansion Joints. Design for temperature changes of 120ºF with expansion joints provided as required and shown on shop drawings. Expansion joints shall have no metal-to-metal contact.

PART 3 - EXECUTION

3.1 PREPARATION

A. Field verify existing dimensions and conditions prior to preparation of shop drawings.

3.1 ERECTION

A. Erection shall comply with approved shop drawings.

B. Schedule after all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

C. Columns sleeves (styrofoam blockouts) or anchor bolts if required, shall be furnished by approved manufacturer and installed by General Contractor to dimensions and elevations shown on approved shop drawings.

D. General Contractor shall provide covers and/or protection for block-outs and/or anchor bolts after installation and prior to walkway cover erection. Use means necessary to protect canopy materials and the installed work of other trades.

E. Workmanship shall be of very best with neat miters and fitted joints.

F. Bents shall be aligned with care before grouting.

G. Aluminum columns imbedded in concrete shall be protected by clear acrylic, tested for alkali resistance. Columns shall be grouted with 2,000 lb. compressive strength grout to within 2 inches of top of column sleeve.

H. General Contractor shall finish concrete sidewalk level to surrounding walk where required.

I. Downspout columns where required shall be filled with grout to discharge level to prevent standing water.

J. Aluminum deflectors shall be installed after grouting.

K. Refer drawing details for downspouts tied to underground drainage system.

K. Components of canopy to be cleaned on completion and work area left in neat condition.

END OF SECTION

SECTION 10 7333

ELECTRONIC MARQUEE SIGN

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Electronic marquee sign including Sign Supports, concrete foundations and accessories.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: manufacturer's specifications and other data needed to prove compliance with specified requirements.

C. Shop Drawings: Show construction details and installation instructions.

1.3 PERFORMANCE REQUIREMENTS

A. Design exterior signs and concrete foundations to withstand positive and negative wind loads as calculated in accordance with International Building Code, 2012 Edition.

B. Thermal Movement: Design, fabricate and install component parts to provide for expansion and contraction over a temperature range for material of 150° F. (83.3°C.), without buckling, sealant joint failure, glass breakage, undue stress on members or anchors, and other detrimental effects.

C. Flatness of Panels: Panels shall have no visual distortion when viewed in installed position. All panel faces shall be of such flatness that when measured, maximum slope of surface at any point, measured from nominal plane of surface, shall not exceed 1.0%. All panels not meeting these requirements are subject to rejection by Architect.

1.4 WARRANTY

A. In addition to the required one-year warranty, provide 5 years' parts and labor warranty for message center to cover defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 ELECTRONIC MARQUEE SIGN

A. Basis of design: Nevco Inc. or Owner approved equal.

B. Materials:

1. Aluminum Housing: Fabricated from 0.050 and 0.080 inch minimum thickness, ASTM B221 aluminum sheet. Finish with acrylic polyurethane paint with ultraviolet inhibitor providing long lasting finish.
2. LED: Designed to provide excellent visibility from all angles and sides.
3. Control cable: Wireless Ethernet.
4. Fasteners, anchors, brackets and other exposed hardware shall be corrosion resistant.

C. Monochrome Double Sided Marquee:

1. Type: Exterior electronic, monochrome, LED, double sided marquee, post supported. 16MM Monochrome with Grayscale LED message Center. 3 feet high with six message lines.
2. Viewing area: 48 pixels high x 144 pixels wide.
3. Approximately hanging weight: 846 pounds.
4. Message center depth: 8 inches.
5. Number of message lines with 4.4 inches high characters: 6
6. LED display elements: Red LED.
7. LED pixel pitch: 0.63 inch.
8. Pixel brightness: 6,500 NITS minimum.
9. Color capacity: 256 shades of Red.
10. Viewing angles: 140 degrees horizontal and 60 degrees vertical.
11. Hybrid pixel design: Each pixel shall have protective louver.
12 Power requirements: Input 85-265 VAC; power consumption: 1042 watts
13 Ambient operating temperature: -40 to 150 degrees F.
14. Should replacement of a block of pixels be necessary, message center shall be pixel by pixel adjustable to compensate for the effect of age degradation.
15. Maintenance access: Front.

2.2 MESSAGE CENTER CONTROL SYSTEM

A. Provide operating software to use with computer as provided by Owner.

1. Message center shall be controlled from remote location by one person. Access to message center control shall be limited by a hardware security key. Access shall be further limited by customer protected password.

B. Communication link: Wireless Ethernet System. Status of communications between Composer Software and Message Center shall be constantly monitored.

C. Graphic capability: Text, animation, logos, multiple fonts, moving messages and video file capability.

1. Each message center “project file” shall contain all the required information to successfully establish message frames on a given message center, from user created “playlists”. These frames and playlists shall have user definable attributes to comply with local sign laws regarding timing and presentation.

D. Input: Control software shall have ability to import AVI, BMP, JPG and GIF image files from Adobe, Corel, and other standard computer graphics software.

E. Control Software shall consists of a single MMI window. Switching between windows and programs to affect message center properties shall not be allowed.

F. Proof Performance: Software will provide an event record as proof of performance.

G. Display dimming: 16 levels controlled automatically with sensor.

H. Automatic scheduling: Provide for creating schedule to display sored with messages.

I. Provide temperature probe and photocell.

2.3 ACCESSORIES

A. Provide cable of required length in installation drawings. Provide temperature sensor/photocell and all mounting hardware as required for complete installation. Electrical junction boxes and conduits will be by others.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Notify General Contractor in writing of unacceptable substrate. Beginning work indicates acceptance of substrate. Subsequent modifications to substrate become the Signage Contractors' complete responsibility.

B. Signage Contractor shall inspect his own work and that of his subcontractors prior to installation.

C. All electrical lighting and power devices contained within or upon signage devices which are usually included as part of illumination system of that device, such as lamps, sockets, internal wiring, etc. are to be provided by the Signage Contractor as part of the finished Marquee Sign. Additionally, Signage Contractor is responsible for electrical connection only of signage items. Power distribution to required locations is responsibility of Owner or his designated agent unless otherwise specifically noted in the Drawings.

D. Make necessary field measurements to insure correct positions, height, and/or orientation of sign at location.

3.2 INSTALLATION

A. Sign Installer shall provide any licenses or permits required for the installation of this sign.

B. Install Marquee Sign in accordance with the drawings, approved shop drawings, and manufacturer's product data. Signs shall be installed level, plumb and true to line at the locations shown.

C. Pour reinforced concrete base. Install sign support in accordance with manufacturer's instructions and approved shop drawings.

D. Coat fabrications and anchors to be built into concrete construction using bituminous coating, 15 mils dry film thickness.

E. Provide all accessories for a complete installation.

3.3 CLEANING

A. Just prior to date of Substantial Completion, clean and polish surfaces. Remove stains and repair or replace damaged work.

B. Remove all visible traces of tapes, adhesive, wrappings or refuse from the installation and clean all exposed surfaces in accordance with manufacturer's written cleaning instructions.

3.4 DEMONSTRATION AND TRAINING

A. Provide at least two-hour on-site training sessions for personnel and one hour session for the designated Technology Account Manager.

END OF SECTION

SECTION 10 7500

ALUMINUM FLAGPOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Ground set aluminum flag pole and accessories specified or necessary for complete installation.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's printed specifications and installation instructions.

C. Shop Drawings. Show general layout, dimensions, base details, anchorage, finishes and components of system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tapered Aluminum Flagpole
- 01 Provide all standard fittings for a complete installation.
- 02 Standard type 25’-0” exposed height above ground
- 03 Minimum wall thickness: 0.250 inches
- 04 Outside butt diameter, 6 ½ inches minimum.
- 05 Outside top diameter, 3 ½ inches minimum.
- 06 Seamless extruded 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 6” dia ball/gold anodized aluminum.
- 10 Clear anodized aluminum, clear cover with cylinder lock.
- 11 Halyards: Nylon with metal core.
- 12 Provide required hardware to accommodate two((2)4’x6’ flags and secure halyards.

B. Flags
- 01 Size: nominal 4’ x 6’.
- 02 Provide one (1) Texas stare flag and one (1) US flag at each flag pole
- 03 Flags shall be 100% nylon, with double stiched sems and edges.
- 04 Provide grommets for attachment to halyards, minimum two (2) per flag.

2.2 ACCEPTABLE MANUFACTURERS

A. Acme Flagpole Company

B. American Flagpole

C. Bartol Company, Inc.

D. Babcock - Davis Associates, Inc.

E. Concord Industries

F. Lone Star Flags & Flagpoles.

G. John Ewing & Co., Inc.

H. Kronberg's Flags and Flagpoles

I. Metal Arts

K. Texas Flagpole Company

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in location shown on the drawing in 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 3000

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish and install appliances specified

B. Install Owner provided appliances:

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   01 Manufacturer's specifications and other data needed to prove compliance with specified requirements.
   02 Manufacturer's installation instructions.
   03 Samples of color charts showing manufacturer's full range of colors.

PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. Ice Machine: Scottsman Model #CU3030MA-1A or approved equal. 30”W x 30”D x39”H. Produce 313# ice per day.

B. Countertop Water/Ice Dispenser: Hoshizaki Model DCM-270BAH or approved equal.

C. Automatic Coffee Brewer: Equal to Bunn Model VLPF, 3.8 gallons of coffee per hour. Provide two (2) decanters for each brewer/

2.2 THE FOLLOWING APPLIANCES WILL BE FURNISHED BY OWNER, INSTALLED BY CONTRACTOR:

A. Residential Washer and Dryer.

B. Refrigerators

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Adjust for proper operation.

END OF SECTION

SECTION 11 40 00

FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Documents, apply to the Work specified in this Section.

1.2 SUMMARY OF THE WORK

A. Project Name and Location: Cimarron Elementary School
Galena Park ISD

B. Approval of Working Surface: Any contractor performing work over the work of other contractors shall notify the Architect of any unsatisfactory conditions. The beginning of work by any contractor shall constitute acceptance of the previous work.

C. Field Verification of All Dimensions: Before ordering any materials or doing any work, field verify all measurements of the building and be responsible for their accuracy. No extras will be allowed for variations from drawings in existing conditions or work performed under this contract. Any discrepancies found shall be submitted to the Architect or Foodservice Design Professionals (FDP) for instructions before proceeding.

D. Cutting and Patching: No excessive cutting will be permitted, nor shall any structural members be cut without the written approval of the Architect. Each Contractor shall leave all chases and openings straight, true, and of the proper size in their work, as may be necessary for the proper installation of their and other contractors' work. After such work has been installed, the contractor shall carefully fit around, close, repair, patch, and point up the same as directed to the satisfaction of the Architect.

E. Cooperation: The General Contractor, all other contractors, and all subcontractors shall coordinate their work with all adjacent work and shall cooperate with all other trades to facilitate the general progress of the work. Each trade shall afford all the other trades every reasonable opportunity to install their work and store their material.

F. Inspection and Tests: The architect, Owner, Foodservice Design Professionals (FDP), and their representative shall always have access to the work, whether in preparation or progress. Provide proper and safe facilities for such access and inspection.

G. Fees, Permits, and Inspections: Secure and pay fees for all permits, licenses, and inspections as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, codes, rules, regulations, and contract requirements bearing on the work.

1.3 SCOPE OF WORK

A. Include the Work specified, shown, or inferable as part of Food Service Equipment. Portions of this Work may be subcontracted to those qualified to do such work as necessary because of jurisdictional trade agreements and restrictions.

B. The General Contractor is responsible for Related Work specified in other Sections: i.e., final plumbing, electrical and mechanical connections. The Kitchen Equipment Contractor (KEC) is responsible for all internal connections.

C. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up, and equipment adjustment in this contract. Plans and specifications shall be

considered mutually explanatory. Work required by one, but not by the other, shall be performed as though required by both. Items required by one but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings so that all equipment items shall be entirely functional for the purpose for which they were designed and intended. Provide all necessary material, tools, equipment, and labor required for the complete delivery, un-crating, erection, and installation as designated on the food service equipment plan and, in the specifications, to be made ready for final connection by the appropriate Division contractors. When there is any discrepancy between drawings and specifications, bidders should seek clarification of any discrepancies from the Architect and or Foodservice Design Professionals (FDP) before bidding.

D. Should the drawings disagree in themselves or the specifications with the drawings *(and clarification was not sought before bidding)*, the higher cost, better quality, more stringent, and greater quantity of the work or materials shall be completed without additional costs to the Owner.

1.4 OTHER DIVISIONS/CONTRACTORS RELATED WORK

A. Division 03 (Concrete) is responsible for but not limited to:

1. Slab depressions reinforced concrete wearing bed at prefabricated walk-in assemblies.

2. Concrete or masonry platforms (with a finished top and coved base at the perimeter) for the raised setting of food service equipment.

3. Slab depressions to receive stainless steel drain trench liner/grate assemblies (provided under this Section).

B. Division 09 (Finishes) responsible for but not limited to:

1. Interior finished floor with a coved base at prefabricated walk-in assemblies.

C. Division 10 (Specialties) responsible for but not limited to:

1. S/S Corner Guards throughout the kitchen (unless specified otherwise).

2. Lockers.

D. Division 22 (Plumbing) is responsible for but not limited to:

1. All connections shall be made in accordance with local codes and national standards, except where plans and specifications exceed those codes and standards.

2. Empty PVC and wide-sweep bends for refrigerant piping to beverage lines, Co2 lines, and remote food service equipment refrigeration systems.

3. Rough-in and final connection of plumbing systems to food service equipment and between components (including materials and labor). Accessories provided loose with food service equipment by Section 11 40 00 to be field installed by Division 22. This includes but is not limited to the installation of all faucets (water fill faucets, pre-rinse faucets, etc.), hoses, gas disconnects and drains from the equipment point of connection to building plumbing systems. All drain lines are provided and installed by Div. 22.

    a. Kitchen Equipment Contractor is responsible for providing all faucets (water fill faucets, pre-rinse faucets, etc.), drain fittings, mixing valves, control valves, water pressure regulators, vacuum breakers, and all accessories for equipment specified under 11 40 00. Division 22 is responsible for installation.

4. Indirect drain line runs from the equipment to the nearest drain or floor sink—lines to be type ‘K’ Copper.

5. If any plumbing accessories or fittings are provided loose with equipment by 11 40 00, Div. 22 is to attach to equipment and provide final connection.

6. Gas Supply Systems with all components and fittings required for a complete system.

7. Water Supply Systems with all components and fittings required for a complete system.

8. Compressed Air Systems with all components and fittings required for a complete system (if required for this project).

9. Piping and Drainage Systems (Sanitary and Grease-laden). ***Systems must be cleaned and flushed before the final connection with food service equipment - Critical.***

10. Floor Sinks (Provide and Install). Flange and grates to be flush with the finished floor.

11. Floor Drains (Provide and Install). Flange and grates to be flush with the finished floor.

12. Trench Drains (Provide and Install). Trench Liners provided by 11 40 00. Flange and liners to be flush with the finished floor.

13. Grease Traps as required (Size, Provide, Locate, and Install). Verify with local codes to bypass or pipe through Grease Trap and/or Interceptor.

14. P-Traps as required (including all disposers).

15. Interconnect water through Water Filter (Filter provided by 11 40 00 unless otherwise specified) to equipment.

16. Gas Quick Disconnect Installation (Quick Disconnect provided by 11 40 00).

17. Safety Restraint Cable Installation (Safety Restraint Cable Provided by 11 40 00).

18. Specified couplings and piping to all equipment furnished by 11 40 00.

19. Air Compressors (if required for this project) (Size, Provide, and Install unless otherwise specified).

20. Water Softeners (if required for this project) (Size, Provide, and Install unless otherwise specified).

21. Pressure Boilers (if required for this project) (Size, Provide, and Install unless otherwise specified).

22. Hand Sinks (Provide (unless otherwise specified) and Install). Provide a hot water tempering valve if required. Water temperature to be at least 100 degrees and flow for at least 20 seconds.

23. Ice Bin Drain Insulation (if Ice Machine is provided in this project) (Provide and Install).

24. Unions at disposer solenoid valves (if Disposer is provided in this project) (Provide and Install).

25. Back Flow Prevention as required (Provide and Install - including all disposers). Back-Siphonage shall be installed at all fixtures and equipment where backflow and/or back-siphonage may occur and where a minimum air gap cannot be provided between the water to the fixture or equipment at its flood/level rim. When furnished with equipment,

vacuum breakers shall override the above if acceptable with applicable codes. Division 22 is responsible for verifying requirements with local codes.

26. Janitor Sink with Faucet (Provide and Install).

27. Freeze Proof Hydrant at the exterior of the building by receiving door (Provide and Install - unless otherwise specified).

28. Reverse Osmosis Systems (Size, Provide (unless otherwise specified), Locate, and Install).

29. All piping within the counter body or under fabricated counters must be run to a connection point below the counter body by Section 11 40 00—final connection by Division 22.

30. Exhaust Hood condensate drain connections (if Exhaust Hood is provided in this project) (Provide and Install).

31. Interconnection of ½" CW to Pre-Rinse and Disposers cone/body inlets piped through the solenoid and vacuum breaker (if Disposer is provided in this project).

32. Fire System Piping. The exposed piping is to be chrome plated.

33. Pipe ½" cold water to swirl inlets at disposers (if Disposer is provided in this project).

34. Water Treatment for Ice Builders (Non-Chlorinated water with a PH Level of 10 or Higher) and any drains and overflows. Piping from Ice Builders to Tumble Chillers by Div. 23 (if Ice Builders and Tumble Chillers are provided in this project).

35. Refer to Section 2.2 PLUMBING / MECHANICAL REQUIREMENTS for additional information.

E. Division 23 (Mechanical) responsible for but not limited to:

1. All connections shall be made following local codes and national standards, except where plans and specifications exceed those codes and standards.

2. Empty EMT Conduit with pull-wire and wide-sweep bends for refrigerant piping to remote food service equipment refrigeration systems.

3. Rough-in and final connection of mechanical systems to food service equipment, walk-in assemblies, and between components (including materials and labor).

4. A mechanical contractor will test and balance rooms and exhaust hoods. **Balance report for food service Exhaust Hoods to be provided to Foodservice Design Professionals (FDP) immediately upon completion (send to Houston.Submittal@fdp.org) and must be submitted with O&M manuals.**

5. Exhaust Hoods, Condensate Hoods, Fire Suppression Systems, connections, and controls (Provide and Install – unless otherwise specified). Provide tempered air at all supply ducts.

    a. If Exhaust/Condensate Hoods and Fire Suppression Systems are specified under Section 11 40 00, Division 23 is responsible for all Exhaust and Condensate Hood connections (Provide and Install).

6. VFD System and controllers when required by code (Provide and Install).

7. Provide and install all ventilation (direct or indirect), air conditioning, and heating systems (unless otherwise specified).

8. Coordinate Supply and Return ducts above Serving Counters. No cold air is to blow directly on hot food counters or open-air refrigerated merchandisers.

9. Coordinate Supply and Return ducts away from equipment with top-mounted refrigeration. No cold air is to blow directly on compressors.

10. Mechanical Contractor to locate temperature monitors within return ducts.

11. Circulating air above walk-in assemblies (Provide and Install).

12. Circulating air above and in air gaps at warehouse cold storage assemblies (Provide and Install).

13. Water Chillers as required (if equipment is provided in this project) (Provide, Size, and Locate).

14. Piping from Ice Builders to Tumble Chillers (if equipment is provided in this project) (Size, Provide and Install).

15. Refer to Section 2.2 PLUMBING / MECHANICAL REQUIREMENTS for additional information.

F. Division 26 (Electrical) responsible for but not limited to:

1. Rough-in and final connection of electrical systems to food service equipment, walk-in assemblies, and between components (including materials and labor). Accessories provided loose with food service equipment by Section 11 40 00 to be field installed by Division 26.

2. Empty EMT Conduit with pull-wire and wide-sweep bends for refrigerant piping to remote food service equipment refrigeration systems.

3. Empty EMT Conduit with pull-wire and wide-sweep bends for interconnect cables between LAN and POS terminals, change-makers, pre-check units, printers, CPUs, etc. Division 26 to verify where the conduit will run for POS System (i.e., Manager's Office or IDF Room).

4. Empty EMT Conduit with pull-wire and wide-sweep bends for fire suppression systems. Interconnect the Fire Protection System to panel box shunt trips and building alarm.

5. Walk-in Assembly Light Fixture Installation (Provided loose by Section 11 40 00) (if Walk-in is provided in this project).

6. Table Limit Switch (Provided loose by Section 11 40 00) (if Dishmachine is provided in this project) – Install and interconnect to Dishmachine.

7. Electrical Materials and Devices (Shunt-trip breakers, surge protectors, lighting control devices, conduit, wire, etc.).

8. Switches and Stainless Steel Disconnects as required (Provide, Locate, and Install – to be in an accessible location).

9. Charging Stations for Forklifts, Pallet Stackers, and Pallet Jacks (Size, Provide, Locate, and Install) (if equipment is provided in this project).

10. Interconnection between Condensate Fan and Dishmachine control panel (if equipment is provided in this project).

11. Interconnection between Exhaust Hood fans and switch (if equipment is provided in this project).

12. Interconnection between Exhaust Hood lights and switch (if equipment is provided in this project).

13. Door Heaters, Lights, Coils, and Heated Pressure Relief Ports pre-wired to the junction box at the top of walk-in assemblies (if equipment is provided in this project) provided by Section 11 40 00—final connection by Div. 26.

14. If any electrical accessories, fittings, and cord/plugs are provided loose with equipment by 11 40 00, Div. 26 is to attach to equipment and provide final connection.

15. Provide waterproof receptacles in wet areas.

16. All electrical connections beneath Exhaust Hoods (if equipment is provided in this project) to extend to shunt trip breakers with electrical panel box for shutdown during fire mode.

17. Receptacles will be pre-wired to Junction Box or Load Center for final connection by Division 26.

18. All electrical lighting, power, and distribution systems.

19. Do not interconnect more than three (3) convenience outlets on one (1) breaker.

20. Other than convenience outlets, all electrical connections on food service plans are dedicated breakers.

21. Doorbell at receiving door (Provide and Install –audible throughout Kitchen, Office, and Dry Storage room).

22. Adequate lighting at receiving door.

23. (if Walk-in is provided in this project) Walk-in Manufacturer is to provide Two (2) Edwards 860 Series (or equal) red lens, surface-mounted Xenon Emergency Strobe Beacons. Walk-in manufacturer will install One (1) located in the Kitchen above Walk-In Freezer door (or Cooler door when Freezer is within Cooler in an 'inline' assembly), and provide the second unit loose for installation by Division 26 located in the Cafetorium (Division 26 to coordinate location with Owners and Architect). Division 26 is to provide all conduit and wiring required and interconnect the illuminated Push Button Panic Alarm in the Walk-In Freezer to both Strobe Beacons (***Critical***). Coordinate with Division 27.

24. Dedicated circuit for heated drain line connection in Walk-In Freezer (120/1/16.0 Amp) at each coil (if Walk-In is provided in this project).

25. GFCI Breaker for all receptacles under Exhaust Hoods (if Hoods are provided in this project) and Holding Cabinets (if Holding Cabinets are provided in this project), to be located within Kitchen's electrical Breaker Panel and not at the receptacles.

26. Remote GFCI reset switches to be accessible to end user.

27. All electrical below Exhaust Hoods (if Hoods are provided in the project) are to have Shunt Trip Breakers.

28. Interconnect Temp Sensor to Exhaust / Supply fans (if Hoods are provided in this project).

29. Electrical contractor to provide conduit with pulled wires prior to installation of equipment.

30. Refer to Section 2.5, ELECTRICAL REQUIREMENTS, for additional information.

G. Division 27 (Communication) responsible for but not limited to:

1. Data line coordination for food service equipment.

2. Time clocks as required.

3. Video cameras for learning assistance in food service areas as required (Provide, Locate, and Install).

4. (if Walk-in is provided in this project) (Provide conduit, data line, and interconnect the illuminated Push Button Panic Alarm inside the Walk-In Freezer to the Building Automation System (BAS). When activated, facility personnel are to be notified - coordinate notification requirements with the Owner (***Critical***). Coordinate with Division 26.

H. Division 28 (Electronic Safety and Security) is responsible for but not limited to:

1. Security Cameras as required (Provide, Locate, and Install).

I. General Contractor responsible for but not limited to:

1. Any wall penetration required for food service equipment utilities. Escutcheon plates or S/S sleeves are to be provided and installed as needed.

2. Bulk Freezer Ventilation Pipe (if Bulk Freezer is provided in this project) (Provide and Install unless otherwise specified).

3. Core drilling for Guide Rails (if Guide Rails are provided in this project).

4. Refrigeration Roof Curbs / Roof Jack (if Refrigeration System is provided in this project and located on the roof).

5. Interior Bollards (if required for this project) – to be epoxy painted per local codes (Provide and Install).

6. Furnish and Install ¾” Plywood blocking in the wall for mounting equipment furnished by Section 11 40 00 as required.

7. Walk-in Depressions (to be dead level) and sand leveling bed (if Walk-in is provided in this project and recess is shown).

8. Structural bracing for Bulk Walk-in Assembly ceiling panels if required.

9. Menu System Video Monitors in Servery (unless otherwise specified).

10. Structural bracing for Menu System Video Monitors if required.

11. Interior/Exterior refrigeration penetrations and sleeves at building penetrations.

12. DoorScope viewer (peephole) with wide viewing angle at receiving door.

13. Canopy at receiving door. Coordinate height with the height of Receiving Door (8') and the mounting height of Air Screen above the door.

14. Soap and towel dispenser provided by Owner. G.C. is responsible for installation.

15. Washer and Dryer (Provide and Install, unless otherwise specified).

16. Dwarf wall at exposed front/ends of cafeteria serving counters with the finish as selected by the Architect (if required in this project).

17. Substrate (Provide and Install) at SS Wall Caps for pony walls.

18. Final cleaning of all equipment before demonstrations.

1.5 QUALITY ASSURANCE

A. In addition to complying with all applicable laws, statutes, building codes, and regulations of public authorities, comply with the following:

1. National Sanitation Foundation (all equipment to bear label)

2. National Electric Code

3. Underwriters' Laboratories, Inc. (all applicable equipment to bear label)

4. American Gas Association Laboratories

5. National Fire Protection Association

6. Americans with Disabilities Act

7. Food and Drug Administration HAACP Guidelines

8. International Energy Conservation Code (IECC)

9. Department of Energy

10. Environmental Protection Agency

11. CSA Group

B. Furnish certification of regularly manufactured equipment listing or classification by Underwriters Laboratories, Inc., with the initial submittal.

C. Furnish a list of equipment and components (internal and external) that are not of domestic origin. All equipment and components (internal and external) should be of domestic origin when possible. This information should be provided with the initial submittal.

D. Projects outside the continental United States shall adhere to all local authorities having jurisdiction over that project.

1.6 SUBSTITUTIONS

A. **The specified equipment items or components are intended to be the basis of the bid. All other brands, including any additional names, which may be listed as "Alternates" or "Approved Equal," must conform with the general and item specifications, warranties, size/dimensions, quality, accessories, function, voltage, horsepower, etc. of the first-named brand and be subject to Paragraph C-03 of this Article.**

B. Proposed Substitutions:

1. Submitted at least 14 calendar days before Bid Date.

2. Submit proposed substitutions with catalog data and manufacturer's shop details indicating all modifications required to conform with the specified brand.

3. List of deviations must include equipment name, model number, accessories, and features with deviation(s) noted for specified and proposed alternate equipment. Equipment without listed deviation(s) will be considered furnished as specified.

C. Substitutions with prior approval:

1. Submitted on Bidder's letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in Paragraph B-02.

2. Owner reserves the right to accept or reject any or all substitution proposals before execution of the Contract.

3. Provide all design/engineering services required to adjust in space, systems, utilities, etc., and pay all additional costs of utilities, construction, or professional services that may be incurred due to the acceptance of any substitution.

D. All appliances or other equipment within a common group or category (e.g., refrigerators, kettles, ovens, shelving, etc.) must be from the same manufacturer.

1.7 INTERPRETATION OF DOCUMENTS

A. During Bidding: Bidder's, supplier's, or vendor's questions and comments about Construction Document's clarity or intent will be addressed by addendum.

B. After Award:

1. Clarification Bulletin will confirm Construction Document requirements.

2. Request for Information submitted by Contractor shall contain Contractor's proposed resolution.

1.8 WARRANTY

A. Provide a written warranty for parts and labor for one year ***from the date of Substantial Completion***, including an extended four-year replacement warranty on compressor bodies.

B. Components of equipment subject to replacement before one year's use (such as refrigerator door gaskets) and those items which may fail due to improper or inadequate periodic maintenance by the Owner/Operator (such as an uncleaned refrigeration system condenser) are not intended to be included within the scope of the Warranty.

C. Refrigeration Systems/Equipment: One-year free service available within twenty-four hours of notification.

D. Furnish three copies of a list of all equipment and their respective local service agencies, indicating the address, telephone number, and name of the person to contact. The service agencies selected shall be factory-authorized for the equipment assigned whenever possible.

E. Provide the following for refrigeration systems/equipment unless specified otherwise:

1. One (1) year of free refrigeration system service is available within twenty-four hours of notification.

2. Provide five (5) year manufacturer's registered written replacement warranty certificate covering compressor bodies. Warranty to cover labor costs for the first year.

3. Provide ten (10) years of the manufacturer's registered written replacement/repair warranty certificate covering walk-in assembly panels. Warranty to cover defects in material and workmanship. Warranty to cover labor costs for the first year.

4. Provide two (2) year parts and labor warranty for ***all parts/components (including third-party components that may be utilized)*** of the refrigeration system(s) ***(including freon)***, walk-in cooler(s), and freezer(s) not otherwise covered herein.

F. ***All above-stated warranty periods are from the date of Substantial Completion***. All replacement parts due to a warranty call should be the same quality as the original, or better if the original were defective. Replacement parts should be of domestic origin where possible.

1.9 SUBMITTAL DATA

A. **All submittals must be received, reviewed, and approved as noted prior to equipment procurement. If any equipment is procured prior to this process, it is on the KEC to replace any equipment, accessories, or other components that may not meet the specifications or design intent for the facility, including all costs associated with rectifying the errors made in procuring the equipment before this critical process.**

B. Special Requirements: The following are in addition to any general requirements given elsewhere in the Documents.

C. Submittal Requirements:

1. Kitchen Equipment Contractor to furnish all submittals via PDF, drawings to be scaled per General Specifications and provided in Three (3) submittal packages.

2. Foodservice Design Professionals requires the below-listed business days for each package submitted. Packages are to be submitted within 14 days between each issued package. Each package should contain individual submittal sets.

a. Package One to include (2) Individual sets: 10 Business Days for Review

i. Equipment rough-in

ii. Equipment Brochure

b. Package Two to include (3) Individual sets: 10 Business Days for Review

i. Exhaust Hoods

ii. Walk-in Cold Storage Assemblies

iii. Refrigeration

c. Package Three to include (4) Individual sets: 15 Business Days for Review

i. Custom Fabrication

ii. Serving Counters

iii. Merchandising Equipment

iv. Miscellaneous Submittals

D. Submittals to be identified with the below-listed file name structure:

1. 11 40 00-1 EQUIPMENT BROCHURE

2. 11 40 00-2 EQUIPMENT ROUGH-IN PLANS

3. 11 40 00-3 CUSTOM FABRICATION

4. 11 40 00-4 SERVING COUNTER

5. 11 40 00-5 EXHAUST HOODS

6. 11 40 00-6 WALK-IN COLD STORAGE ASSEMBLY

7. 11 40 00-7 REFRIGERATION

8. 11 40 00-8 BEVERAGE MERCHANDISER

E. Package One (1) requires both submittals: Brochure and Rough-in plans. **If not sent together, the submittal will be rejected.**

F. Foodservice Design Professionals (FDP) will notate all submittals in RED. Architects and General contractors will be notated in color per their direction.

G. If hard copy submittals are required, Kitchen Equipment Contractor will furnish all copies to the specified trades as required.

H. If discrepancies, missing information, or incorrect information occur within the documents, Kitchen Equipment Contractor is to seek clarification or note the need for further direction on submittals. The Kitchen Equipment Contractor is to bid the higher of the discrepancies. *Refer to Section 1.3 SCOPE OF WORK: Subsection D.*

I. Brochure Format (for regularly manufactured equipment and components):

1. Front and rear protective cover with labeled project name.

2. Brochure index: Indicate Functional Area/Room number, item number, quantity, description, and manufacturer.

3. A separate flysheet for each component or item of equipment, indicating item number, name, quantity, manufacturer, optional equipment, modifications, special instructions, and utility requirements. Any equipment or assembly containing more than one buyout sub-assembly or component shall have the second item listed in parenthesis beside the primary item name—for example, Serving Counter (hot food well).

4. Catalog specification sheet with all options notated on the specification sheet and manufacturer's drawing.

J. Shop Drawings (Rough-In Drawings):

1. Separate drawing sheets: same size as Contract Drawings (Contract Drawings are not to be traced or reproduced). Submittal drawings are to be provided by Kitchen Equipment Contractor and not copied or reproduced from Contract Documents. Any reproduced submittal drawings will be rejected.

2. ¼” scale drawing of fixed/movable food service equipment and prefabricated Walk-in assemblies with itemized schedules.

3. Special Conditions Drawings, sizing, and locating the following conditions:

   a. Slab depressions, cores, sleeves, or block-outs (walk-in assemblies, drain trenches, piping, etc.).

   b. Concrete or masonry platforms.

   c. Pipe sleeves or roof jacks.

   d. Wall openings or block-outs for pass-through equipment, recessed control panels, in-wall fire-protection system components, etc.

   e. Blocking grounds or anchor plates required in walls for equipment support/attachment.

   f. Above-ceiling hanger assemblies for support of exhaust hoods, ceiling-mounted pot racks, etc.

   g. Access panels in walls or ceiling for service of equipment.

   h. Ceiling pockets or recesses for unusually high equipment.

   i. In-wall carriers for wall-hung or cantilevered equipment.

4. Electrical Rough-In Drawing

5. Plumbing and Mechanical Rough-In Drawing

6. Required information:

   a. All fixed and portable food service equipment shown on Contract Drawings.

   b. All prefabricated Walk-In Assemblies and Conveyor/Dishtable Assemblies shown on Contract Drawings.

   c. All general-use and convenience utilities or services indicated on Contract Drawings, including those required by or connected to equipment or devices, not in this Section.

   d. All Rough-In Drawings: Fully dimensioned from engineering benchmark (column lines, when provided) and finished-room surface to the point of stub-up through floor and stub-out through wall or ceiling for all mechanical, electrical, and plumbing services.

   e. Connection number/tag system and symbols: Identical to Contract Drawings.

K. Shop Drawings (Manufacturer’s and Fabricator’s):

1. Sheet Size: Identical to Contract Drawings, drawn or plotted at a ¼” scale for plan view, ½” for elevations, and 1½” for sections and construction details.

2. Included information: The item number, name, and quantity.

3. Construction details, sections, and elevations to reflect the requirements of the Specifications and Drawings.

4. Indicate adjacent walls, columns, and equipment.

5. Indicate plumbing and electrical schematic drawings for equipment such as conveyors, waste systems, self-cleaning exhaust hoods, exhaust hood fire protection systems, and fabricated fixtures with a single electrical or plumbing connection.

6. Mechanical or electrical operating components or products integrated into a fabricated fixture: ventilation and service access required or recommended by the manufacturer, including panel size and location to permit easy lubrication, adjustment, or replacement of all moving parts.

L. All equipment and engineering rough-in plans sheet numbers are to match the contract documents. All equipment item numbers and engineer item numbers located on the schedules are to match the contract documents. All engineering requirements must be updated to accommodate the provided equipment and match the contract documents. The Kitchen Contractor coordinates any MEP revisions to accommodate the supplied and proposed equipment. The Kitchen Equipment Contractor is responsible for any costs associated with equipment substitution.

M. Foodservice Design Professionals (FDP) drawings and schedules are not to be copied in any way. Any replicated drawings of Foodservice Design Professionals (FDP) will be rejected.

1.10 SERVICE MANUAL

A. Three copies bound in 1½" hardback, three-ring binders (as many volumes as required by the scope of the project) with the same data as the brochure after installation (Refer to "Submittal Data"). Provide separate service manuals for each independent area within the project scope (Main Kitchen, Culinary, Concession, etc.).

B. Each Volume: Section for maintenance of finish materials (e.g., stainless steel, plastic laminates, FRP, Plexiglas, etc.).

C. Catalog specification sheet and/or manufacturer's shop drawings, including wiring diagrams when applicable.

D. Each Volume: Index of items, manufacturer's operating/maintenance information, replacement parts data, list of all product warranties, and price lists. Provide the name, title, and address of personnel at each respective manufacturer and service personnel to be contacted for spare/replacement parts and service after the warranty period.

E. To the greatest extent possible, provide two copies of the manufacturer's instructional video cassettes for operating, maintenance, and equipment service.

F. Internally subdivide binder contents with permanent page dividers, logically organized by equipment item number or manufacturer name, with tab titling printed under reinforced, laminated plastic tabs.

G. Electronically submitted manuals must follow the formatting requirements listed above.

H. **Service Manual to be provided to the owner before kitchen equipment demonstration.**

1.11 VERIFICATION AND COORDINATION OF PROJECT / DATA

A. Utilities Rough-in Drawings and field verifications are to be completed within four weeks after receipt of notice-to-proceed. Review Contract Drawings and Submittal Data for accuracy and completeness and notify Architect of conflicts and proposed adjustments. Coordinate work with other sub-contractors.

1. KEC to provide on-site field verification of all underground utilities before pouring concrete for capacity and location and coordinate with General Contractor. Submit a review to Architect and General Contractor. If rough-ins need to be relocated, KEC will compensate other trades for the required relocation.

2. KEC to provide on-site field verification of all other utility connections and locations and coordinate with General Contractor. Submit a review to Architect and General Contractor.

B. On-Site Inspection Reports

1. Before concrete pour: The Kitchen Equipment Contractor is to submit a copy of the report below to the Architect, General Contractor, and Foodservice Design Professionals (FDP) within 24 hours of the inspection. The form to be submitted is contained within these General Specifications.

2. Before delivery of equipment: The Kitchen Equipment Contractor is to submit a copy of the report below to the Architect, General Contractor, and Foodservice Design Professionals (FDP) within 24 hours of the inspection. The form to be submitted is contained within these General Specifications.

FOODSERVICE DESIGN PROFESSIONALS

0n - Site Inspection Report

Prior to Concrete Pour

Inspection Date_____ **Project Name** _____

Project Location_____

Inspector's Name_____ **Company** _____

Inspector's Contact Number_____ **Email** _____

Architectural Firm_____ **Project Architect** _____

Architect's Contact Number_____ **Email** _____

General Contractor_____ **Project Manager** _____

G.C. Contact Number_____ **Email** _____

Food Service Consultant Foodservice Design Professionals, LLC **Project Manager**_____

Contact Number 281.350.2323 **Email** _____

An on-site Inspection to verify the location of UNDERGROUND utilities was conducted on this date. The following conditions were observed and brought to the attention of the General Contractor. (KEC is to provide a written description and copy of the Utility Plan indicating the corrective action required).

1. What difficulties were encountered?

Inspector's Initials _____

This Inspection Report is the responsibility of the Kitchen Equipment Supplier and the General Contractor. Coordination between the two parties is mandatory.
Neither the Architect nor FDP need to be present at these inspections.

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

FOODSERVICE DESIGN PROFESSIONALS

CSA INSTALLATION APPROVAL REPORT

Report Date_____ **Project Name** _____

KEC Firm_____ **Phone Number**_____

Contact Name_____ **Email** _____

- ☐ **Walk-In panels are installed square, plumb, and level. Inspected prior to interior concrete pour.**
- ☐ **Ceiling panels are installed flush and tight to wall panels with undamaged gasket material. Any signs of condensation at joints or walls should be reported to FDP and addressed immediately. Caulk at panel seams will not be an acceptable solution.**
- ☐ **All cam-locks are engaged, and buttonholes are in place.**
- ☐ **Gaps under the screed or floor angle (due to shimming) are entirely sealed to the slab.**
- ☐ **Penetrations in the ceiling or wall panels are insulated and sealed.**
- ☐ **Weatherproofing / thermal barrier material is installed.**
- ☐ **All sharp edges of metal doors and diamond treadplate are clean of sharp edges and deburred.**
- ☐ **Door bumper or wall protection is installed and located as to prevent damage of door to adjacent walls.**
- ☐ **Cove base installed at all wall bases internal and external of walk-in.**
- ☐ **Door systems are correctly installed, and the door is self-closing and seals around the opening perimeter and at the floor threshold. Threshold has a smooth and level transition.**
- ☐ **Upon completion of the electrical connections, confirm the final operation of the IC/IC+ control, door heaters and light switches.**
- ☐ **Entrapment hardware and alarm systems are installed and functioning.**

KEC SIGNATURE_____

COMMENTS_____

_____

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

FOODSERVICE DESIGN PROFESSIONALS

0n - Site Inspection Report

Prior to Delivery of Equipment

Inspection Date_____ **Project Name** _____

Project Location_____

Inspector's Name_____ **Company** _____

Inspector's Contact Number_____ **Email** _____

Architectural Firm_____ **Project Architect** _____

Architect's Contact Number_____ **Email** _____

General Contractor_____ **Project Manager** _____

G.C. Contact Number_____ **Email** _____

Food Service Consultant Foodservice Design Professionals, LLC **Project Manager**_____

Contact Number 281.350.2323 **Email** _____

An on-site Inspection to verify the location of INSTALLED utilities was conducted on this date. The following conditions were observed and brought to the attention of the General Contractor. (KEC is to provide a written description and copy of the Utility Plan indicating the corrective action required).

1. What difficulties were encountered?

Inspector's Initials _____

This Inspection Report is the responsibility of the Kitchen Equipment Supplier and the General Contractor. Coordination between the two parties is mandatory.
Neither the Architect nor FDP need to be present at these inspections.

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

C. Review critical systems/components for application, performance, and capacity and submit calculation worksheets with the initial submission of brochure/rough-in drawings, with all proposed adjustments noted, including:

1. Exhaust hood removal/supply air volume, velocity, static pressure, duct collar sizes, and locations.

2. Refrigeration Systems (compressor, condenser, and evaporator) capacities/sizes, quantities, and refrigerant piping distances/sizes.

3. Exhaust Hood Fire Suppression Systems (nozzle locations, air handler, fuel interlocks, piping/distance limitations).

4. Locations of Vacuum Breakers.

5. Conformance of Refrigerated Components/Equipment with HACCP Guidelines (e.g., salad/sandwich pans, upright/open refrigerator cabinets, salad bars) with HACCP Guidelines.

6. Gas and water line sizes and manifold configurations.

7. Diameter and length of flexible connector lines for fixed/movable gas appliances.

8. Fabricated Equipment load center panels (individual and total amperage calculations and circuit balance).

9. ADA compliance of workstations, service positions, passageways, etc.

D. Ceiling mounted appliances/fixtures: Verify and coordinate dimensions/location of support framing/hangers with the General Contractor—all material and installation below 12’-0” AFF: Section 11 40 00.

E. Dimension Responsibility: Obtain actual or guaranteed measurements for the proper equipment fit. All dimensions indicated in Contract Documents are approximate and are as accurate as can be determined at the time. Field-check all horizontal/vertical measurements and conditions at the building before fabrication or delivery of equipment and notify the Architect of all conflicts or deviations from the dimensions shown.

F. Checking Dimensions at Site: Before ordering any materials or doing any work, verify all measurements of the building and be responsible for their correctness. No extras will be allowed for variations from drawings in existing conditions or work performed under this contract. Any discrepancies found shall be submitted to the Architect for instructions before proceeding.

G. Scheduling to Fit Openings: Should it become necessary to schedule the construction of walls or partitions before delivery of fixed equipment, the equipment must be fabricated for passage through finished openings. Maintain close contact with the project and be cognizant of all conditions, including vertical handling limitations within the building (elevator cabs or openings, stairs, etc.) and possible hoisting requirements. Coordinate all procedures with General Contractor and Project Team.

H. Refrigerated and Dry Storage Areas: Verify and coordinate dimensions to accommodate scheduled modular shelf sections. Notify Architect of the variance between the Contract Documents and actual conditions.

I. Color/Pattern Selections: Submit selection samples of solid polymer products, plastic laminate, paint or stain finishes, and vinyl-coated surface material of equipment as selected by the Owner.

J. Movable Equipment Interface: Rolling stock (pan racks, carts, dollies, dish/tray/rack dispensers) required to fit through or into fixed equipment (roll-in refrigerators, counter bodies, etc.) is to be reviewed and coordinated for compatibility at the time initial of shop drawing submittal. Indicate conflicts and proposed adjustments.

K. Relocation of Work: Relocate or re-route work as required to coordinate related items free of charge if no extra work is involved.

L. **Kitchen Equipment Contractor must provide FDP with the food service equipment lump sum pricing (including material and labor) after the contract has been executed and *before submittals* are provided to FDP. *This information is critical to FDP for accounting/billing purposes.***

1.12 EQUIPMENT FURNISHED / INSTALLED BY OTHERS

A. Obtain and coordinate utility requirements of Owner-Furnished/Owner-Installed (OF/OI) equipment with the building utilities and rough-in drawings/provisions.

B. Coordinate physical data of OF/OI appliances or equipment and incorporate information into Submittal Drawings. Vendor- or Purveyor-Furnished equipment (e.g., coffee/tea equipment): same as OF/OI.

1.13 WORK INSTALLED BUT FURNISHED BY OTHERS

A. Coordinate delivery/installation schedule of Owner-Furnished/Contractor-Installed (OF/CI) equipment with the Owner at least ninety (90) days before equipment requirement.

B. Obtain and coordinate utility requirements of OF/CI equipment with the building utilities and rough-in drawings/provisions.

C. Receive at the job site and fully incorporate into installation procedures as if furnished under this Section.

PART 2 - PRODUCTS

2.1 FABRICATED FIXTURES MATERIAL / COMPONENTS

A. Stainless steel sheets or shapes: 18-8, Type 302, polished to 180 grit No. 4 finish.

1. Stainless steel joints and seams: Heli-arc welded, free of pits and flaws, ground smooth, and polished to a No. 4 finish.

2. The “grain” direction of horizontal stainless-steel surfaces: Longitudinal, including the backsplash. The polishing procedure at right-angle corners of fixtures shall provide a mitered appearance.

B. Galvanized Iron Sheets: Armco copper bearing Zinc Grip or Zinc Grip/Paint Grip.

1. Galvanized iron joints and seams: Arc-welded, free of pits, flaws, and ground smooth.

2. Galvanized sheets or shapes: Washed with mineral spirits and painted with Rust-Oleum gray semi-gloss enamel.

C. Sound Deadening: Schnee Butyl Sealant ½" wide rope positioned continuously between all frame members or contact material and underside of stainless-steel surface (sinks, tabletops, food wells, over shelves, and undershelves). Tighten stud bolts for maximum compression of sealant and trim excess.

D. Plastic Laminates: Color/pattern selected by Architect, in 1/16" thickness for flat surfaces: 1/32" thickness for radiused surfaces. Plastic laminates and adhesives must be NSF-approved (Standard No. 35).

E. Solid Polymer products: Color/pattern/material selected by Architect in thickness as specified. Solid Polymers and adhesives must be N.S.F. approved (Standard No. 51).

F. Casters:

1. Fabricated fixtures with "Open Base" construction: Jarvis and Jarvis Model No. 5-405-113P-NSF swivel casters with grease seals on forks and wheels; Zerk fitting in swivel; two casters: Model No. E-75 Verti-Lock brakes. All casters: B-7" rolling bumpers with stainless steel top discs.

G. Cutting Boards: 1/2" thick Read Products, Inc. "Richlite" cutting board, size as indicated.

H. Identification Plates, Labels, Tags:

1. Prohibited Information: Names of suppliers, fabricators, and contractors.

2. NSF Labels: Required on all pieces of equipment.

3. Required Information: Function or purpose of controls such as display light switches, food warmer controls, etc.

4. Plate Construction: Engraved phenolic plastic, secured to equipment with epoxy cement or stainless-steel screws. Furnish samples.

2.2 PLUMBING / MECHANICAL REQUIREMENTS

A. Plumbing Fittings and Components: Furnished under this Section as follows:

Note: Fitting and components described in Items 1, 2, 3, 4, and 5 are furnished loose by 11 40 00 for final installation and connection by Division 22.

1. Control valves and appliance pressure regulators for water, gas, steam, and vacuum breakers: wherever required on food service equipment (chrome-plated where exposed).

2. Faucets and drains with and without connected overflows (unless otherwise indicated) for all sinks.

3. Specialty food service water-fill faucets, hose bibbs, or hose assemblies indicated in drawings/specifications.

4. Wade Model No. W-10 Shock-Stop shock absorbers for all food service equipment with quick-opening or solenoid-operated water valves.

5. Dormont Series Water Quick Disconnect hose, diameter per water connection size requirements, with safety fitting, w/coiled restraining device, full port ball valve, antimicrobial coating, lifetime warranty.

6. Extensions of indirect waste fittings to open-sight floor sink or floor drains from sinks, under bar equipment, and food-holding components of serving counters (e.g., cold pans, hot food wells, refrigerator/freezer coils not equipped with condensate evaporators) furnished and installed by Division 22. Drains: All drains to be type 'K' Copper – Paint with aluminum paint where exposed**. Div. 22 to ensure a minimum air gap of 1" and not less than twice the effective opening of the indirect waste pipe, per code. Div. 22 to ensure all drain lines are centered over floor sink grate openings and no water splashes on the floor.**

7. Piping brackets and supports beneath fabricated equipment.

8. Closed Base Bodies: Removable 18-gauge stainless steel closure panel at plumbing penetrations under the top.

9. Control valves on Open Base fixtures: Mounted on a 14-gauge stainless steel gusset-shaped panel with h 3½" setback from the countertop edge/rim to the face of the control handle.

10. Fill hose/faucet at support pedestals or Closed Base Body: Installed in a 15" x 18" x 5" deep recessed mounting panel. Panel bottom: sloped on a 60° angle, with 3/8" stainless steel rod hanger-bracket for the hose.

11. Provide filtration option as shown on contract documents (a, b, c, or combination thereof):

    a. In-line Water Filter System:

        i. Everpure System filters for coffee/tea brewers, icemakers, water chillers, convection steamers, and beverage systems. They should be sized per the manufacturer's recommendation.

    b. Remote Central Water Filter System.

    c. Remote and/or In-line Reverse Osmosis system.

B. Gas-Heated Equipment Fittings and Components: Furnished under this Section as follows:

1. Fixed Equipment: Dormont 1675KIT2S48 gas appliance connector: Diameter per fuel volume/connection size requirements. Gas valve diameter size per fuel volume/connection size requirements.

    a. Restraining device: Heavy duty steel cable, fastened to equipment and walls, 3" to 6" shorter than equipment connector length.

C. Final Plumbing Connections Provisions:

1. Fabricated equipment containing components, fittings, and devices indicated on food service connection drawings to be connected to the building systems: each component, fitting, or group thereof pre-piped to a utility compartment for final connection by Division 22. Refer to drawings for capacities.

2. Field-assembled equipment (e.g., prefabricated walk-in assemblies, exhaust hoods, ware wash machines, convection ovens, etc.): plumbing components completely

interconnected under this Section for final connection arrangements indicated on Utility Connection Drawings.

3. All plumbing final connection points of equipment shall be tagged, indicating the following:

   a. Item number

   b. Name of devices or components

   c. Type of utility (water, gas, steam, drain, chilled water)

D. Ducts and Vents:

1. Exhaust hoods furred-in to ceiling: 2” high duct collar for final connection to the duct system.

2. Warewash machines equipped with integral vent cowls or extended hoods: furnished with 18-gauge stainless steel seamless duct risers to 6” above the finished ceiling for final connection. The duct: trimmed at the ceiling with a 16-gauge stainless steel angle flange with all corners welded.

E. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Sub Sections E. Plumbing and F. Mechanical for additional information.

2.3 FOOD SERVICE EQUIPMENT REFRIGERATION SYSTEMS

A. Install complete with all refrigerants, oil, dials, dehydrators, gauges, and controls required for the system’s proper operation.

B. Self-contained or factory-installed compressors: Check and adjust to the proper operating temperature prescribed by FDA/HACCP.

2.4 PLUMBING TRIM

A. Faucets: Furnished for all sinks or equipment requiring open water supply.

B. Fill Faucets: Furnished for appliances requiring open water supply.

C. Drain Fittings: Furnished for all sinks or equipment requiring removal of liquids. Install specified chrome-plated or stainless-steel fittings in die-stamped openings with washers and locknuts. The solder may be used as a sealer but shall not be applied to the top surface of the drain fittings.

2.5 ELECTRICAL REQUIREMENTS

A. All electrical systems, components, and accessories within the work of this Section: Certified to be in accordance with NEC 70.

B. Electrical Fittings and Components: Furnished under this Section as follows. Coordinate food service equipment loads, voltage, and phase with the building system and confirm any existing or OF/OI equipment requirements.

C. Cord and Caps:

1. Coordinate all food service equipment cord/caps with related receptacles.

2. All 120, 120/208, and 208 volts “plug-in” equipment shall have Type SO or SJO cord and plug with ground wire fastened to the frame/body of the item.

3. Cord lengths for fixed equipment: Adjusted to eliminate loose-hanging excess.

4. All non-fixed plug-in “buy-out” equipment: Hubbell configuration and ratings as required.

5. All mobile electrical support equipment (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutters, toasters, coffee makers, microwave ovens, etc.): 8’-0” cord length with cord-hanger strap secured to the rear of equipment or mobile stand.

D. Switches and Controls:

1. Each motor-driven appliance or electrically heated unit: Equipped with a control switch or starter per Underwriters’ Laboratories, Inc., with low-voltage and overload protection.

2. Disposer controls recess-mounted in the wall: External fittings and accessories removed from the enclosure and furnished with 12-gauge stainless steel perimeter angle flange with welded corners. Install control at 4’-0” AFF to the bottom of the enclosure.

3. Disposer controls recess-mounted in counter-splash risers: External fittings and accessories removed from NEMA 4 enclosure and furnished with 12-gauge stainless steel perimeter angle flange with welded corners. Install control at 3’-0” AFF to the bottom of the enclosure. Provide the panel with a 60” long Seal-Tite electrical conduit from the bottom of the control panel for final field connections under Division 26.

4. Equipment that is not provided with built-in circuit breakers or fused terminal block and is indicated on Utility Connections Drawings to be directly connected to the building electrical system: a NEMA 4 stainless steel disconnect switch furnished and installed by Division 26.

5. All remote manual starters, disconnect switches, magnetic contactors or starters, and push-button stations: NEMA Type 4 enclosure; NEMA Type 1 enclosure only when installed in a Closed Base Body.

E. Heating Elements:

1. Electrically heated equipment: Thermostatic controls.

2. Water heating equipment: Equipped with positive low water shut-off.

F. Receptacles and Switches:

1. Receptacles installed in vertical panels of support pedestals or Closed Base Bodies: installed in 12” x 8½” x 3” deep recessed mounting panel sloped at a 60° angle and turned up to the top of the opening.

2. Pre-wire receptacles in closed base fixtures to a junction box installed within 6” from the bottom of utility or compressor compartments.

3. Receptacles mounted on Open Base fixtures: Installed on a 12” x 10½” x 4½” deep 14-gauge stainless steel panel with returned ends and sloping recess—secure panel to the underframe of fixture top.

4. Pre-wire receptacles on open base fixtures to a junction box secured to a leg or mounted on the underside of the lower shelf. Vertical runs of wiring: Made in rigid conduit or within the tubular leg.

5. Receptacles installed in/on-fabricated equipment: Hubbell, Inc. assemblies horizontally mounted in a metal box with stainless steel cover plate.

6. Switches installed in/on-fabricated equipment: Hubbell, Inc. with metal box and stainless-steel cover plate. Switches: pre-wired to the controlled device and a junction box installed within 6" from the bottom of the utility or compressor compartment. All refrigeration system switches: Installed within the compressor compartment near the door opening.

7. Load centers installed in/on fabricated equipment to have all fixture components pre-wired to the load center with balanced phase loading. Load center: Ready for final connection by Division 26 and flush-mounted within the utility compartment rear panel, set back 8" from the access door. All breaker/device information will be typewritten on the circuit schedule in the load center door (number corresponding breaker/device) with an enclosed schematic wiring diagram of fixture components.

8. All receptacles are to be pre-wired to the cord and plug assembly and routed through the over-shelf post at all island equipment locations unless specified otherwise.

G. Light Fixtures:

1. Light fixtures with lamps installed in/on fabricated or field-assembled equipment: pre-wired to a junction box for final connection (continuous-run fixtures when indicated).

2. LED Display Light: Install light fixtures full-length of Display Stand and Serving Shelf with stud bolts and pre-wire through support posts to an apron-mounted switch.

3. Heat Lamps: Installed to the underside of serving shelf assemblies. When multiple 24" heat lamps are specified, provide maximum length heat lamp chassis. Install all switches remotely from lamps.

4. **Walk-in assembly LED Light Fixtures: Furnished by Section 11 40 00, final installation by Div. 26. All electrical wiring and conduit, provided by Div. 26, electrically connected through the Vapor Proof light fixture base connection, located on the interior door header—all Conduit to be Seal-tight conduit. Door frame wiring stubs out the top of panels 8" in flexible conduit for final connection by the electrical contractor. All horizontal conduits: below ceiling panels. All lighting fixtures will be wired from inside the assembly—no penetrations through the ceiling panels. Seal-sleeved penetrations are airtight at both sides of the panel. KEC is responsible for verifying that trade contractors seal all penetrations.**

H. Final Electrical Connection Provisions:

1. Fabricated equipment containing electrically operated components or fittings indicated on Utility Connections Drawings: Direct connected, with each component, fitting, or group pre-wired to a junction box for final connection by Division 26. Refer to drawings for circuit loading.

2. Fabricated equipment containing electrically operated components and devices indicated: Circuit-breaker load center with each component or device pre-wired to a separate circuit breaker for balanced phase loading and single final connection by Division 26.

3. Field-assembled equipment (e.g., prefabricated walk-in assemblies, exhaust hoods, ware wash machines, etc.) shall have electrical components completely interconnected in this Section for final connection arrangements as indicated on Utility Connection Drawings by Division 26.

4. Pre-wire the following groups of walk-in assembly electrical devices to a top-mounted junction box for final connection by Division 26 per compartment grouping (unless otherwise indicated).

   a. Light fixtures and switches; heated pressure-relief ports.

   b. Door/jamb heaters.

   c. Evaporator fans, defrost elements and drain line heaters.

5. All electrical final connection points of equipment shall be tagged, indicating the following:

   a. Item number.

   b. Name of devices on the circuit.

   c. Total electrical load.

   d. Voltage and phase.

I. Lamps: in all food service equipment containing light fixtures. Refrigerator or heated cabinets: All exposed LED lamps above or within a food zone: Shat-R-Shield lamps or standard lamps, sleeved with end caps.

J. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsection F. Division 26 (Electrical) for additional information.

2.6 CUSTOM – FABRICATED / ASSEMBLED UNITS

A. Mechanical or electrical operating components or products integrated into a fabricated fixture: Ventilation and service access required or recommended by the manufacturer. The size and placement of the service access panel(s) permit easy lubrication, adjustment, or replacement of all moving parts and are to be indicated on fabrication shop drawings.

2.7 BAKER TABLETOPS (Unless specified otherwise)

A. 14-gauge 304 S/S top with 2” square turn down at the front, 6” high enclosed splash at two (2) sides and rear. Brace same as “Counter/Tabletops.”

B. 1¼” x 6” high integral coved riser at rear and ends unless indicated otherwise on drawings.

C. 16-gauge stainless steel flour-trough at free long sides, secured to the underside of the top. Trough: 3” diameter with eased edges/corners.

2.8 COUNTER / TABLETOPS

A. 14-gauge stainless steel; all free edges turned down 2” with ¾” tight hem at the bottom—free corners: rounded on ¾” radius.

B. Marine edges: Turned up ½" on 45º angle and turned down 2" with ¾" tight hem at the bottom.

C. Cafeteria serving countertops at hot food stations: Full-length x 3½" x ½" high raised rail at (customer's) front side with 45º integral turndown to counter surface.

D. Tops abutting high fixtures or walls: Cove up specified height and slope back 1½" at the top on 45º angle; 2½" slope where piping occurs. Turn down 1" at the rear of the splash and tight ends to the bottom of the top turndown. Secure splash turndown to the wall with a 4" long 14-gauge stainless steel "Z" clip anchored to the wall, 36" OC.

E. Freestanding tables and all serving counter splash-risers: Turned back at a 90º angle with 1" turndown at the rear.

F. Brace tops with rigid-welded 1½" x 1½" x 1/8" galvanized steel angle frame at the perimeter with cross bracing 2'-0" OC maximum. Provide 4" x 4" x 12-gauge stainless steel triangular pads where leg gusset welds to frame. Paint the entire frame with Rust-Oleum gray semi-gloss enamel. Angle frames: Secured to the underside of top surfaces with ¼" studs welded 9" OC maximum with chrome-plated washer, lock washer, and cap nut. Studs: Such length that cap nuts can be made up tight, bringing the top down snugly on the angle frame, eliminating all vibrations or "oil-canning."

G. Tops: 1½" overhang at free sides of underframe or Closed Base Body.

H. Mockett Model No. SG5-26 chrome-plated/plastic grommet assembly or integrally welded stainless-steel flange or inverted gusset where service utilities or support posts penetrate or abut tops, ground, and polished to match the top. When conditions permit, provide a 1" x 1½" rectangular backsplash opening for service utilities instead of piercing the horizontal surface. Install stainless steel split tubing at the raw edge of the opening.

I. Extend underbracing members to the wall, turn down 6", and anchor to the wall when specified to be mounted on leg/bracket assembly.

J. All openings in tops: 3/16" high raised die-formed edges.

K. All top openings for pans or inserts: 20-gauge stainless steel, watertight liners, 8½" deep, secured to the underside of the countertop.

L. All "built-in" and "drop-in" counter equipment/appliances to have framing members at the perimeter of the opening.

M. Scrap Basket: 18-gauge stainless steel construction 6½" x 6½" x 21¾" long. Top of container: 5/8" wide x ¼" high full perimeter flange with ¼" diameter stainless steel rod bail handle. Interior vertical corners coved on ½" radius. Countertop: Fitted with 6¾" square die-stamped opening.

2.9 COLD PANS

A. 14-gauge stainless steel with ¾" coved interior welded integrally to the countertop with a 3/16" raised edge at the perimeter of the opening – depth of cold pan to follow NSF 7 compliance.

B. Slope bottom to required quantity of Component Hardware Model No. E16-4021 drain fittings at 48" OC maximum. Sleeve through insulation at drain fittings and extend common drain line into utility compartment for indirect waste connection.

C. ½" OD copper refrigerant lines in a serpentine pattern, 1½" OC flattened for maximum contact. Secure tubing to the underside of ¼" thick aluminum "distribution plate" installed tight to the underside of the frost plate area and apply cold-conductive mastic to all surfaces.

D. Component Hardware Model No. E16-4021 drain fittings at 48” OC maximum, sleeved through the insulation with common drain line extended into utility compartment.

E. Heat Cable: Low-wattage, full-perimeter, below countertop at the edge of depression. Secure with “Z” clips, 9” OC, and interwire with compressor switch for simultaneous operation.

F. Enclose the sides and bottom of pans with an airtight 18-gauge galvanized jacket and pack with 2” fiberglass insulation set in mastic.

G. Compressor: Size as indicated or required to accommodate the size of the cold pan. Locate the compressor in the compartment below the unit or as shown on the drawings.

H. Sectional 16-gauge stainless steel perforated false bottom (¼” holes, @ ¾” OC). Turn down 1½” on all sides, weld corners, and provide finger rings. False bottom sections: 24” long maximum.

2.10 DRAWERS

A. Stainless Steel Liners: Component Hardware Model No. S81-2020C (20” x 20”), easily removable with drawer in the fully extended position.

B. Drawer Frame: 16-gauge stainless steel flanged out at the top. Weld the frame to a double-panel 16-gauge stainless steel drawer front with full-length recessed pull at the top (similar profile as Garcy Model No. R-1060) with closed ends.

C. Channel-formed horizontal pull: ¾” turndown at the front and ends with ½” tight hem. The front edge of the pull: flush with the face of the drawer. Recess behind pull: sloped up on a 60° angle, terminating 1” below the bottom edge of pull.

D. Mount drawer frame on Component Hardware Model No. S52-2020 self-closing slides, with Delrin bearings, full-depth of the fixture. Secure slides to the body or brackets to eliminate lateral movement in the extended position. Refrigerator drawers: Component Hardware Model No. S52-2024 stainless steel slides with Delrin bearings.

E. Drawer enclosure in an Open Base Fixture: 18-gauge stainless steel flanged out at the top for attachment to the underside of the tabletop. The lower edge of the enclosure is flanged in toward the open bottom. Mount drawer slides to enclosure and brace as required. The face of the enclosure is to be the same length and height of the drawer face. Provide ¾” deep offset in front of the enclosure and 2½” from the underside of the tabletop for a flush-fitting appearance.

F. Drawer enclosure on freestanding fixture: Full depth of table framing.

G. Drawer enclosure in a Closed Base Fixture: Completely partitioned from the adjoining area. Drawer front: Flush fitting with the face of the body.

H. Drawer Liners other than tool/utility: **Bread Drawer:** S/S liner sized to fit drawer; **Refrigerated Drawer:** S/S liner sized to fit drawer.

I. Cash Drawer: Integral stainless-steel body, 3” deep.

2.11 FOOD WELLS (UNLESS SPECIFIED OTHERWISE)

A. Food Warmer Controls: Remote-mounted in sloping recessed apron panel. The control panel is recessed 2½” from the bodyline at the top of the 60° slope and 1” at the lower edge. Terminate slope angle 2½” below the countertop. Mount panel on concealed piano hinge at bottom edge; secure with screws at upper corners.

B. Manifold all warmer drains and extend to within the utility compartment for indirect waste connection. Install valve in the drain line and extend handle through compartment door.

C. Removable 18-gauge stainless steel closure panel at the underside of warmers.

D. 14-gauge stainless steel plate/utensil shelf full-length of hot food station unless noted otherwise: 10" below countertop x 9" deep, with rear panel coved up to the underside of the countertop; end panels turned up square. Front of shelf: Turned down 1½" and returned under for closure panel attachment.

E. Food wells: Hatco Model No. HWBIBRT-FULD insulated food warmer (1200 watts, 208 volts, single phase) secured to the underside of 12" x 20" die-stamped countertop openings with thermal breaker mastic rope applied at the perimeter of food well flange.

F. Soup Warmers: Hatco Model No. HWB-11QTD soup warmer secured to the underside of 11" diameter die stamped countertop opening with thermal breaker mastic rope applied at the perimeter of soup well flange. The maximum allowable temperature of the countertop at the contact surface is: 120°F. Each warmer: Equipped with one 11-quart stainless steel round insert and slotted cover.

2.12 SINKS

A. 14-gauge stainless steel; all interior corners (horizontal/vertical) coved on ¾" radius. 1½" wide double-walled partitions with flat tops between compartments.

B. Continuous exterior panels of multiple-compartment sinks: 14-gauge stainless steel filler panel welded ground and polished between compartments.

C. Sinks (with overflow): Score and slope sink bottom ½" to die-stamped opening fitted with Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece. 18-gauge stainless steel bracket: Welded to sink bottom for drain stem with 1½" handle clearance.

D. Where sinks are installed in fixtures with Closed Base Body, provide a Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece. (Sinks with dimensions larger than 20" x 20" in Closed Base Body will not have overflow fitting.) 18-gauge stainless steel bracket: welded to sink bottom with T & S Model No. BL-4740-1 guide bushing. Install on shortened drain stem, one T & S Model No. BL-4710-1 remote control stem assembly only (length as required) with Model No. 113-L universal joint and white blank button. Set drain control handle in Cambro Model PSB-6 bowl with bottom omitted (dress raw edge) to permit passage of drain handle—secure bowl in utility compartment door or body panel with clear silicone.

E. When single-hole deck-mounted faucets are specified, install overflow fitting in the sidewall of the sink compartment and provide ell-fitting in connecting tubing.

F. Flush Covers when specified: 1/2" thick Read Products, Inc. "Richlite" cutting board with two (2) finger holes, size as indicated. Support clips: ¼" stainless steel rod 2" long, formed at 45º with two ¾" leg ends (¼" long threaded ends). Insert rod clips through tight-clearance holes in the sink, seal watertight, and secure with stainless steel acorn nuts or tack-weld at the exterior of the sink wall. Set support clips ½" below the top. Provide a 14-gauge stainless steel channel or angle support frame to store covers when not in use. Cover holder: Adjacent to sink compartment, below countertop, or under drawer assembly.

2.13 TRAY SLIDES (UNLESS OTHERWISE SPECIFIED)

A. Tray slides: 12" wide, solid 14-gauge stainless steel turned up 2" at the rear behind countertop turndown; turned down 4" at the front and free ends unless otherwise indicated.

B. Three ¼" high die-formed inverted "V" ridges at 4" OC, 2" from the leading edge, terminating 2" from ends of tray slide with tapered ridge ends.

C. Ridges formed on radius: Equal-length segments with 2" separation between chords.

D. Secure tray slides to countertop/body frame, same as "Countertops." Enclose the exposed underside of the tray slide with 18-gauge stainless steel.

E. When indicated, project tray slides 2" beyond the serving countertop and return the entire width of the serving counter at free ends.

F. All tray slides are to be provided and mounted per ADA requirements.

2.14 DISHTABLES

A. Soiled/clean dishtable: 14-gauge stainless steel; free edges coved up 3" with 1½" diameter rolled rim and bullnose corners.

B. Edge of dishtables next to high fixtures or walls: Coved up 10" and sloped back 1½" on 45º angle; 2½" slope where piping occurs. Turn down 1" at the rear of splash and secure to wall with 4" long 14-gauge stainless steel "Z" clips anchored to the wall, @ 36" OC.

C. Exposed rear splash: 16-gauge stainless steel finish panel from the top of the splash to the bottom edge of the rolled rim with a welded vertical joint at the end. Secure the panel with concealed attachment and install bracing 24" OC.

D. Cove all interior corners (horizontal/vertical) on ¾" radius and slope tables 1/8" per foot to sinks, scuppers, or ware wash machines, maintaining level crown/splash.

E. Brace dishtables with 1" x 4" 12-gauge stainless steel channels down the top centerline and between each pair of legs, with closed ends. Bracing: secured to the underside of the dishtable with ¼" studs welded 6" OC maximum, with chrome-plated washer, lock washer, and cap nut. Studs: such length that the cap nuts can be made up tight, bringing the dishtable down on the channel members, eliminating all vibration and "oil-canning."

F. Integrally welded stainless steel flange or inverted gusset where service utilities or support posts penetrate or abut tops; ground and polished to match the top.

G. Hose Bibb: Chicago Model No. 305VBRCF; mounted on 12-gauge stainless steel flange or inverted gusset bracket with 3/8" stainless steel rod hose hanger.

H. Extend underbracing members to the wall, turn down 6", and anchor to the wall when specified to be mounted on leg/bracket assembly.

I. Paper-Drop Opening: 9" square with 4" integral chute having hemmed bottom edge. Slope dishtable top 1" toward the opening, forming a 16" square tapered deposit point.

J. Accessible Tray-Drop Opening: 10" x 18" with integral 16-gauge stainless steel seamless chute sloped at 45º angle toward the center of mobile soak sink position.

K. All dishtables with a Conveyor Type Dishmachine must have a table limit switch provided by Manufacturer and installed by Division 26. Prepare clean dishtable with holes for table limit switch and provide s/s back cover. Wiring must be concealed within dishtable fabrication.

2.15 DISH / TRAY DEPOSIT ASSEMBLY

A. 14-gauge stainless steel deposit shelf, size as indicated. Extend the frame through the opening, flush with the public side of the partition, height as local code authorities require. Turn the shelf down 1" at the front with ¾" return at the bottom (either scribed into a partition or forming reveal). Shelf: 1" square turndown at the long rear side, integral with conveyor slider pan, tray-accumulator, or dishtable. Extend the rear/end splash to align with the head of the deposit station opening. Modify rolled rim at the operator's side of the tray drop window to have a 3" rolled rim.

B. 18-gauge stainless steel window frame with perimeter flange channel-formed 1" x ¾" at both wall sides. Weld all corners of the frame and install with concealed attachment. Align/abut one jamb of the frame with end splash of conveyor slider pan or dishtable whenever adjacent.

2.16 UTENSIL – WASH COUNTERS

A. 14-gauge stainless steel; all free edges coved up 3" with 1½" diameter rolled rim and bullnose corners.

B. Edges of utensil-wash counters next to high fixtures or walls: Coved up 10" and sloped back 1½" on 45º angle; 2½" slope where piping occurs. Turn down 1" at the rear of splash and secure backsplash to the wall with 4" long 14-gauge stainless steel "Z" clip anchored to wall @ 36" OC. Vacuum breaker pockets: 4" long square turnback sections aligned with the slope break line.

C. Exposed Rear Splash: 16-gauge stainless steel finished panel from the top of the splash to the bottom edge of the rolled rim with a welded vertical joint at the end of the splash and ½" turnback at the bottom of the panel. Secure the panel with concealed attachment and install bracing 24" OC.

D. Cove all interior corners (horizontal/vertical) on ¾" radius and slope tables 1/8" per foot, maintaining level crown.

E. Brace utensil-wash counters with 1" x 4" 12-gauge stainless steel channels down the centerline of the top and between each pair of legs, with closed ends. Bracing: Secured to underside of dishtable with ¼" studs welded 6" OC. maximum, with a chrome-plated washer, lock washer, and cap nut. Studs: Such length that the cap nuts can be made up tight, bringing the dishtable down on the channel members, eliminating all vibration and "oil-canning."

F. Integrally welded stainless steel flange or inverted gusset where service utilities or support posts penetrate or abut tops: ground and polished to match the top.

G. Extend underbracing members to the wall, turn down 6", and anchor to the wall when specified to be mounted on a leg/bracket assembly.

H. Hose Bibb: Chicago Model No. 305VBRCF; mounted on 12-gauge stainless steel flange or inverted gusset bracket with 3/8" stainless steel rod hose hanger.

2.17 DOORS

A. 18-gauge x 1” stainless steel double pan-formed welded construction, insulated with 1” thick polyurethane boards. Seal the perimeter joint of the pans. Offset the lower horizontal framing member of the Closed Base Body to align the flush access door with the bottom of the Body.

B. Channel-formed full-length horizontal recessed pull: ¾” turndown at the front and ends with ½” tight hem. The front edge of the pull: Flush with the face of the door. Recess behind pull: Sloped up on a 60° angle and terminated 1” below the bottom edge of pull.

C. Door Hardware

1. Two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge location).

2. Component Hardware Model No. 35-2000 Concealed Magnetic Catch.

3. Component Hardware Model No. D30-4780 lock in the upper free corner of the door.

D. Louvered opening: Cut out opening size as indicated, turn in 1”, and weld. All corners: Ground and polished.

1. Full-height 18-gauge stainless steel louver with 1” vanes at 45º, ½” spacing. Perimeter channel-formed frame: 1½” x 1”.

2. 45º x 1” x ½” x opening width plus ½” 18-gauge stainless steel louver.

3. Tack the louver flange's weld tab to the door's back panel.

E. Drain handles opening: 6” diameter hole through the double pan to accommodate Cambro Model No. PSB-6 Bowl:

1. Secure the bowl to the door panel with clear silicone.

2. Omit the bottom of the bowl. Dress raw edges of opening for passage of drain handle.

3. Exposed insulation at the penetration of the door pan: Painted black.

F. Sliding Doors: fabricate same as Paragraph “A.”

1. Aluminum Sliding Door Track: Component Hardware Model No. B57-0000 Series, length as required. Secure to angle frame at the top of the underside.

2. Front/rear door sheaves: Stainless steel ¾” side-mounted door hangers; two (2) required per door.

3. Recessed Vertical Pull at Upper Corner of Door: Component Hardware Model No. P63-1012.

4. By-Passing Door Guides secured to bottom shelf: Component Hardware Model No. B62-1093.

5. Door Stop at the bottom edge of door: Component Hardware Model No. B60-1086.

G. Offset the lower horizontal framing member of the Closed Base Body/utility compressor compartment to align the door flush with the bottom of the Body.

2.18 CLOSED BASE BODIES

A. Frame: Rigid-welded 1½" x 1½" x 1/8" galvanized steel angle forming a continuous structure around the top and bottom perimeters of the fixture, a post at each corner, studs spaced 48" OC maximum. The top of the frame is cross-braced with 1½" angles, 2'-0" OC maximum.

B. 18-gauge stainless steel panels and trim with concealed attachment. All seams: Welded, ground, and polished.

C. Exposed Vertical Corners: Rounded on ¾" radius. Closed Base Bodies adjacent to walls or fixtures: square corners.

D. Vertical and horizontal channel members at shelf interior or drawer enclosures, such as corners and center mullions: Closed and sealed.

E. Closed Base Bodies set on finished masonry platforms: closed and caulked at the underside of equipment overhang and bolted to the platform. Body overhang of the platform: 1" at free ends and 2" at the front and exposed rear sides.

F. Closed Base Bodies not set on the platform: Component Hardware Model No. A54-2-6, 6" legs spaced 4'-0" OC maximum.

2.19 COMPRESSOR COMPARTMENTS

A. Same material as Closed Base Bodies with back and end partitions; omit bottoms only.

B. 10-gauge steel slide-out support: Channel frame on full extension slides with 125 lb. minimum capacity secured to fixture frame with anti-vibration mountings for maximum sound deadening. Closed Base Body on the solid platform: front-to-back slide-out support channels set 4" above the bottom for air circulation.

C. Access Door: 18-gauge stainless steel double-pan type with a channel formed horizontal recessed pull full length of the top (similar profile as Garcy Model No. R-1060) with closed ends. Channel-formed horizontal pull: ¾" turndown at front and face of the door. Recess behind pull slopes up on a 60° angle, terminating 1" below the bottom edge of pull. Offset the lower horizontal framing member of the Closed Base Body to align the flush access door with the bottom of the body. Door hardware: two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge locations) and Component Hardware Model No. 35-2000 concealed magnetic catch.

D. Access Doors Louver: Full-height, with 1½" x 1" x 18-gauge stainless steel channel-formed frame with welded corners. 18-gauge stainless steel louver. Submit a sample of the design for approval.

2.20 UTILITY COMPARTMENTS

A. Closed Base Bodies or Pedestal Supports: Fitted with utility compartments wherever piping or wiring is required in/on the fixture.

B. Same material as Closed Base Bodies with full-height back and end partitions. Omit bottoms except at hose-reel locations.

C. Access Doors: 18-gauge stainless steel double-pan type with a channel formed horizontal recessed pull full-length of the top (similar profile to Garcy Model No. R-1060) with closed ends. Channel-formed horizontal pull: ¾" turn down at the front of the door, a recess behind

the pull slopes up on a 60° angle, terminating 1" below the bottom edge of the pull. Offset the lower horizontal framing member of the Closed Base Fixture to permit flush alignment of the door with the face and bottom edge of the body. Door hardware: two (2) Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge locations) and one Component Hardware Model No. 35-2000 concealed magnetic catch.

D. No shelves of Closed Base Fixtures are to be penetrated.

2.21 UTENSIL RACKS

A. Rack: ¼" x 2" 300 series stainless steel flat bar with No. 4 finish, fully welded and formed to match the shape shown on drawings. Lowest band - 7'-6" AFF unless otherwise indicated.

B. Ceiling Mount Supports 1-5/8" diameter 16-gauge stainless steel tubing from band to 18" above the ceiling. Anti-sway bracing above the ceiling - 1½" Unistrut members. Tubing penetrations at the ceiling - Component Hardware Model No. A16-0206 stainless steel gussets.

C. Table Mount Supports 1-5/8" diameter 16-gauge stainless steel tubing extended through countertop. Secure to closed base framing or cross rail/undershelf on the open base fixture. Tubing penetrations of countertops - integrally welded stainless steel inverted gusset.

D. Utensil Rack Hooks - Component Hardware Model No. J77-4401 stainless steel hooks spaced 8" OC maximum.

E. Electrical Receptacle: NEMA No. 5-20-R or as noted. Mount in fully welded 3½" x 5½" x 3" 14-gauge stainless steel enclosure with ½" radius corners. Stainless steel cover plate to fit specified receptacle. Pre-wire through tubular support for final connection above the ceiling by Division 26.

2.22 CASHIER / SERVING COUNTERS

A. Exterior Body Panels, when specified: ¾" thick marine grade hardwood plywood with plastic laminate or solid polymer in Architect's selection of color/pattern at all exposed surfaces; backing sheet where concealed.

B. Position, size, and finish horizontal or vertical reveal as Architect directs.

C. Secure panels to counter body framing in a concealed manner. Install removable panels with "Z" clips overlapping body framing members.

D. Hinged doors in exterior body panel(s) - Grass Model No. 1200VZ or 1200VZ8 self-closing hinges. Three (3) required per door; Grass Model No. G/HRZ base plate at each hinge; Ives Model No. TM820 concealed push latch at each door. Confirm Model No. and provide samples with the submittal.

E. Cashier counter to have 16-gauge s/s intermediate shelf, turned down 1 1/2" with tight hem at front. Cove up 2" at rear and sides. Brace undershelf with 1" x 4" 14-gauge stainless steel channel at the longitudinal centerline. Provide an outlet for power/data within the body above the intermediate shelf. Provide cash drawer inserts per district standards.

F. Sneeze Guards to be adjustable and meet NSF standards.

2.23 OPEN BASE STRUCTURES

A. 1-5/8" OD x 16-gauge seamless stainless-steel tubing legs bevelled at the bottom. 1¼" OD cross rails fully welded (360° smooth and polished) to legs at 10" AFF, OC.

B. Top of Leg: Inserted in Component Hardware Model No. A20-0206 gusset fully welded to table frame or sink bottom.

C. Bullet Foot: Component Hardware Model No. A10-0851.

D. Freestanding fixtures requiring utility connections: Component Hardware Model No. A10-0854 flanged feet at the fixture corners, anchored to the floor with non-corrosive bolts.

E. Table Bases: Maximum leg spacing of 6'-0" OC; dishtable and utensil wash counter bases at 5'-0" OC.

F. Open Base equipment specified to be supported by brackets at the rear side only (not completely cantilevered): Tubular legs at the front side only with Component Hardware Model No. A10-0854 flanged feet anchored to the floor with non-corrosive bolts. Front-to-back cross rail: fitted into Component Hardware Model No. A20-0406 circular gusset secured to the wall with non-corrosive bolts.

2.24 UNDER SHELVES

A. Open Base Structures: 16-gauge stainless steel turned down 1½" with tight hem at the bottom. Notch all corners to fit tubular legs and weld from the underside to fill the gap, grind, and polish. Cove up 2" at the rear or ends adjacent to wall, columns, refrigerators, etc. The turn-up at freestanding fixtures is to be hemmed tight to the bottom of the turndown. Brace undershelf with 1" x 4" 14-gauge stainless steel channel at the longitudinal centerline and each intermediate pair of legs.

B. Open Base Structure specified to be supported by brackets at the rear side only (not completely cantilevered): 16-gauge stainless steel turned down 1 ½" at free sides with tight hem at the bottom edge. Notch all corners to fit tubular legs as required and weld from the underside to fill the gap, grind, and polish. Cove up 2" at rear ends, as indicated. Fill the gap at the front-to-back rail, grind, and polish. Brace undershelf with 1" x 4" x 1" 14-gauge stainless steel channel at longitudinal centerline between front to back rails.

C. Closed Base Fixtures: 16-gauge stainless steel turned down 1½" at front. Front edge of bottom shelf: Turned back and sealed to finished masonry platform or boxed for leg application. Center shelf has ¾" tight hem.

1. Shelves: Turn up square at ends (coved up at rear only) to the shelf above or countertop flanged out for attachment with no open spaces at interior.

2. All shelf partitions at exposed ends of cabinet bodies or interiors: Free of exposed framing members.

3. Reinforce shelves with full-length 1" x 4" x 14-gauge stainless steel closed hat channel.

4. Unless otherwise noted, all closed base undershelves must be 22" deep and clear.

5. Fully weld smooth and polish the vertical seam of the shelf turndown/turn up with the face of the body partition.

6. Seal the vertical seam of the square turn-in at the exposed interior of open shelf sections.

2.25 ANCHOR PLATES / WOOD GROUNDS

A. Behind the finished surface, wherever building walls, partitions, or ceiling construction will not accommodate direct attachment of equipment such as over shelves, wall cabinets, hose reels, utensil racks, exhaust hoods, display cases, etc. Material and installation by General Contractor. Location and coordination with trades by Section 11 40 00.

B. Anchor Plates: Not less than 12" x 12" x ¼" thick steel, secured to the structure above or behind the finished surface, positioned at attachment points.

C. Wood Grounds: Length required by fixture, component, or device, 24" wide x ¾" thick plywood secured to partition system before gypsum board installation.

D. Above ceiling supports: Structural shapes (4" x 8.0 lb. channel) suspended from the structure. Maximum height 15'-0" AFF. Size: width of equipment x length of equipment plus 6'-0". Cross bracing at 6'-0" OC maximum.

2.26 OVER SHELVES

A. 16-gauge stainless steel with free edges turned down 1" with ½" tight hem at the bottom—¾" radius at free corners.

B. Turn up 2" raw at walls and sides with a horizontal coved corner at the rear. Round front corners of turn up on ¾" radius.

C. Where shelf width exceeds 12" width, reinforce with ½" x 4" x 14-gauge stainless steel closed hat channel full-length of the shelf.

D. Wall-Mounted Shelves: 16-gauge stainless steel brackets 48" OC maximum, set in 6" from ends.

E. Freestanding Shelves: Where splash is required at free over shelves, turn up square 2" at ends, cove up at the rear, and hem tight to lower edge of front turndown. Weld exposed corners.

1. Freestanding over shelves: 16-gauge stainless steel cantilevered brackets at the rear of the table; double-cantilevered brackets at the center of the table. Posts for cantilevered over shelves are 1-5/8" OD x 16-gauge stainless steel secured to the underframe, 4'-0" OC. Ends of shelves: Secured to adjacent wall/fixture or mounted on 1¼" diameter stainless steel posts.

2. Freestanding over shelves not on cantilevered brackets: 1¼" OD x 16-gauge stainless steel posts, each pair at 4'-0" OC maximum.

F. Baker Table Over shelves: Supported 18" above the top with 1¼" OD stainless steel tubular supports with channel shoe secured to risers.

G. Glass/Cup Rack Over shelf at Dishtables: 14-gauge stainless steel with 1½" deep "vee" trough at free long sides with 1" tight hem inside the trough. Provide a ½" marine edge at free ends and; a 4" splash at the wall. Suspend shelf at 18" above dishtable surface on posts/brackets anchored to dishtable frame/wall at rear; 1" OD stainless steel tubing supports from the structure above the ceiling at front edge, 60" OC at each end.

1. Install at both ends a ½" stainless steel drain tube (connecting both vee-troughs) extended to the dishtable surface through splash turnback.

2. Rack-rest: horizontal full-length 1-5/8" OD stainless steel tubing supported at 10" OC above shelf (8" OC for double service shelf) by 1¼" OD stainless steel tubing with closed ends. Support tubing: welded, ground, and polished, spaced 60" OC.

3. Rack-rest supports to wall: 4" x 4" x 10-gauge stainless steel flange plates welded to support tubing. Anchor flanged plates to blocking ground with non-corrosive bolts.

2.27 DRAIN TRENCH LINER / GRATING

A. Liners: 14-gauge stainless steel in sizes as indicated.

B. Interior of liners: 6" deep with all interior corners (horizontal/vertical) coved on ¾" radius; sloped and scored 1" to integrally welded Component Hardware Model No. D34-Y011 basket drain assemblies @ 48" OC, fitted with 6" long welded tailpiece. Stainless steel safety chain: connected to basket strainer assembly and top of liner wall.

C. Liners: 1" wide perimeter shoulder at the top, turned up flush with finished floor, tight hemmed back down to the shoulder level, and flanged out 2" for attachment to the slab.

D. Underside of sloping liner portion: 2" long "Z" clips.

E. Grating: IMC-TEDDY PFD-ADA removable fiberglass grating:

1. 1" deep "I" bearing bars with 0.6" wide top flange.

2. Full perimeter frame, section quantities, and sizes indicated.

3. Maximum of 2'-0" sections.

4. Grating bars should be spaced 0.4" apart per ADA requirements.

5. Grating to be two (2) equal sizes.

2.28 WALL PANELS

A. Wall Panels: 18-gauge stainless steel, double pan-formed ½" thick with internal stiffener members. Fill with USDA-approved thermal insulation, full height, and width of panels, and attach to the interior with mastic. The maximum allowable temperature at the rear side of the panel: is 120°F.

1. Height of panels as required: Top of tile base to the underside of the hood, top of tile base to the top cap of stub wall, or top of splash to the underside of the hood.

2. Level and square lower edge and sides.

3. Butt joints on all panels.

2.29 EXHAUST HOODS (SURFACE-MOUNTED CONDENSATE)

A. Hoods: Size/shape as indicated: 18" high on the interior.

B. Body: 16-gauge stainless steel, with all seams welded, ground, and polished.

C. Continuous condensate trough at perimeter: 3" x 1".

D. Frame the top of the hood with 1½" angle iron assembly and suspend from the structure above the ceiling by ½" diameter steel rods, drawn tight against the finished ceiling surface.

E. Duct opening/collar as specified with stainless steel louvered grille over the opening.

F. Div. 22 to extend drain line to floor sink when shown. The drain line is to be silver painted. Div. 22 to ensure all drain lines are centered over floor sink grate openings and no water splashes on the floor.

G. ½" diameter steel hanger rods at 4'-0" OC maximum to be by Kitchen Equipment Contractor, but they are to be anchored to the supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.

H. Hoods and components to meet all NSF standards, NFPA 96, UL 710 and current IECC requirements.

2.30 EXHAUST HOODS (UNLESS SPECIFIED OTHERWISE)

A. Exhaust to be provided to meet all current local jurisdiction mechanical and energy code requirements. Kitchen Equipment Contractor to verify code requirements and coordinate with Divisions 23 and 26. Hoods over production equipment to be Type 1 with continuous capture. All Type 1 hoods should be 6' deep to ensure smoke/steam capture unless otherwise noted.

B. Install fire suppression system(s) in all ventilators specified in this section. Install per the manufacturer's recommendations and applicable codes or standards. Submit installation certification form to Architect.

C. Locate chemical cylinders as indicated on drawings and install piping to exhaust hood(s) in a concealed manner. Set cylinders and cabinets at 7'-0" clear AFF unless noted otherwise. Provide polished chrome plated tubing piping/fittings, where exposed at cylinder location and at the interior of exhaust ventilator—exposed pipe threads in/above the food zone are not allowed. Submit a schematic installation diagram and confirm critical distances from cylinders to nozzles.

D. Remote manual release located in the path of egress from the protected exhaust hood area. Kitchen Equipment Contractor to coordinate location with local Fire Marshal requirements before submittal review. All conduits will be recessed within the wall; SURFACE MOUNTING WILL NOT BE ACCEPTED.

E. Provide one (1) handheld Type 'K' and ABC 6-liter fire extinguisher per Ansul system, surface wall mounted.

F. Required quantity and sizes of mechanically operated gas valves.

G. Confirm interconnection of all equipment as required to ensure exhaust hood and fire suppression systems are entirely operational and meet local jurisdiction code requirements.

H. ½" diameter steel hanger rods at 4'-0" OC maximum to be by Kitchen Equipment Contractor, but they are to be anchored to the supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.

I. Provide an appropriate quantity of fire suppression systems as required by local jurisdiction code requirements.

J. Double wall insulated construction at ends. S/S where exposed.

K. Hoods and components to meet all NSF standards, NFPA 96, UL 710 and current IECC requirements.

L. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsection E. Division 23 (Mechanical) for additional information.

2.31 HIGHLIGHTING

A. Polish the following vertical surfaces to a No. 8 finish:

1. Serving and display shelf turndowns.

2. Conveyor and dish/tray deposit station turndowns/frame.

3. Tray slide turndowns.

2.32 SHOP / FIELD JOINTS

A. Field joints: The least number is used only when equipment size must be limited for building or interior space access.

B. Stainless steel tops (including edges and splashes): Fully welded, ground, and polished to match adjacent surfaces.

C. Vertical field joints of fixture backsplashes that are inaccessible from the back: terminate 1" above the horizontal coved corner. The remaining height of the field joint: hairline butt joint with offset draw-angle behind. All horizontal/vertical draw joints: located and noted on shop drawings.

D. Hairline butt joint: 1½" x 1½" x 1/8" steel angles welded to the back/underside of countertop/shelf. Offset angle beyond joining metal edge ½" (min.) to provide a flat backing surface for a joint with the angle of other joining metal edge, set for ½" space between vertical legs of angles. Bolt sections together with 5/16" machine bolts, lock washers, acorn head cap nuts, set 3" OC.

E. Closed Base Bodies: Draw-type with hairline seam fully field-welded.

F. Millwork: Plastic laminated joints shall be dowelled, glued, and draw-bolted with fasteners.

G. Solid Polymer: Surfaces drawn tight, filled, sanded, and finished to match adjacent surfaces.

2.33 PREFABRICATED WALK-IN COLD STORAGE ASSEMBLIES

A. Assembly to be installed by Factory Authorized Installers only.

B. KEC to provide a 1-year walk-in assembly panel installation warranty. Panel installation warranty to cover labor and part replacement issues resulting from a failure to complete the following during installation:

1. Walk-in assembly panels to be installed square, plumb, and level.

2. To create a proper seal, ceiling panels must be installed flush and tight to wall panels with undamaged gasket material. Any signs of condensation at joints or assembly wall panels should be reported to FDP and addressed immediately. Caulk at panel seams will not be an acceptable solution.

3. All cam-locks should be engaged and cam-lock covers in place.

4. Any gaps under the floor angle (due to shimming) must be entirely sealed to the slab.

5. All penetrations in the ceiling or wall panels should be insulated and sealed by appropriate trade contractors and verified by KEC, including but not limited to Light Fixtures, Refrigeration Lines, Sprinklers, Temperature Sensors, etc.

6. Proper installation of the door systems should allow the door to self-close and seal around the perimeter of the door opening and at the floor threshold.

7. Final operation of the IC/IC+ control, door heaters, and light switches should be confirmed upon completion of the electrical connections.

8. The walk-in assembly panel installation warranty will cover service issues resulting from faulty installation.

C. **KEC is responsible for overall install accuracy/quality and quality control of work performed, regardless of the installer or any field modifications due to building/construction conditions. KEC is to provide the CSA Installation Approval Report (provided in this document) to Foodservice Design Professionals (FDP) upon completed installation, verifying that all items above have been inspected by the KEC for completeness and installed per manufacturer requirements. This report will be required as part of the completion of the contract.**

D. Sectional Assemblies: Size/shape indicated on drawings; 9'-6" interior clearance unless otherwise specified. Door locations/size: exactly as shown.

E. Sandwich Panel Insulation: Class 1 Urethane with a vapor barrier, 4" thickness (unless specified otherwise) with mature "U" factor of .030 or lower. Finished panels shall be UL-listed and demonstrate a flame spread rating of 20 or less. Panels must meet performance standards as outlined in U.S. Government legislation.

F. Wherever compartment dimension exceeds the clear-span ability of ceiling panels, provide I-beam support on the exterior of the ceiling or spline-hangers. Install ½" diameter steel rods through beams/hangers and secure them to the structure above. Beams or posts within compartments are not acceptable.

G. Reinforce prefabricated wall panels to rigidly support the door assemblies. The perimeter of the door and frame shall be built of a fiberglass reinforced polymer (FRP) pultrusion. All pultrusion's shall be non-conductive, non-corrosive, rust proof and NSF listed. All doors shall be furnished with a replaceable aluminum braided heater wire, electronically monitored, and controlled as to initiation temperature, termination temperature and percentage of operation time as required. Install 2" x 4" 16-gauge stainless steel hat-channel full-width of the jamb with 1/8" stainless steel removable flush sill, secured with stainless steel screws and sealed watertight to channel.

H. Reinforcement as required to be provided above Freezer door (exterior) and panel next to door (handle side – interior) for mounting of Emergency Strobe Beacon, Push Button Panic Alarm and Release Knob. Emergency Strobe Beacons are by Division 26.

I. Provide an aluminum cove base at the interior and exterior of exposed panels for all floor assemblies.

J. Floor Installations:

1. **8-1/2" Recessed Floor Installation (if required):**

a. Factory floor in slab recess with all joints lapped 6 inches and sealed to form a watertight seal.

b. Level and square prefabricated perimeter and partition wall panels anchored to slab recess. Protect the exposed surface of panels.

c. 4" manufacturer's floor.

d. 15# felt slip sheet over insulation with 6" lapped joints flashed up the height of the finished floor base.

e. 1/2" sand leveling bed by G.C.

f. Concrete flooring and tile over insulation by Divisions 03/09.

K. Modularm Model No. 75LC (Unless otherwise specified). Integrated, flush-mounted temperature monitor/alarm with sensor and probe-cord length required to extend from the exterior front of the assembly to a mounting position of the sensor within the evaporator return airstream. System to have an easy-to-read LCD with high and low alarm set points with audible and visual alerts for alarm conditions. System to include Adaptive Programming for automatic set point control. Wi-Fi connectivity is included for remote notifications of alarms such as power failure, high and low temperatures, entrapment, and door open. System to include a built-in panic alarm. The system is to be interconnected to the Building Automation System (BAS) or the Owner's Network (by Division 27) and to notify facility personnel of the district/owner choosing when activated.

L. Modularm Model No. IP-1 (unless otherwise specified). Heated Illuminated Push Button Panic Alarm with protective cover and Phenolic Label "PANIC ALARM" for entrapment **within Freezer** (ADA mounting height). Panic Alarm Encasing is to be stainless steel (not plastic). Manufacturer to pre-run conduit within panel from Panic Alarm to panel above Freezer door (or Cooler door if 'inline' assembly) for installation of Emergency Strobe/Horn. Division 26 will provide (2) external Emergency Strobe/Horn Beacons and interconnect the Push Button Panic Alarm to external Beacons (One above the Freezer door and One in the Cafetorium in location as directed by Architect). Division 27 will interconnect the Push Button Panic Alarm to the Building Automation System for Owner notification. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsections F. Division 26 (**Electrical**) and G. Division 27 (**Communication**) for additional information.

M. KE2 Smart Access (unless otherwise specified). Confirm all component model numbers for complete installation and operation.

N. LED surface-mounted light fixture, in quantity/arrangement shown on drawings. Light fixtures to be perpendicular to coils. Light fixtures wired to interior and exterior temperature control panel. Light fixtures are to be provided by Section 11 40 00 and installed by Division 26. Division 26 is to seal all conduit penetrations at light fixtures. KEC to verify that penetrations are sealed.

O. Penetrations of Panels: To be sealed by factory installer and appropriate trade contractors, with Dow Corning 3-6548 silicone RTV foam, total depth of the panel. Trim excess flush. KEC to verify that all penetrations are sealed.

P. Install closure panels and trim strips to building walls and ceiling with concealed attachment. Closure material: same as wall panels unless noted otherwise.

Q. Compartment Entrance Doors: 36" x 78" nominal clearance unless otherwise noted.

1. Mount hinged doors on two Kason Model No. 1346; polished chrome-plated nylon cam-lift hinges. All doors to be equipped with polished chrome Kason 1094 or equivalent door closer assembly. Doors to be adjusted so all doors fully self-close.

2. Hinge doors as indicated on drawings.

3. Defrost heater: Thermostatically controlled and replaceable at the entire perimeter of all doors. Defrost heaters to be wired for continuous service.

4. 36" high x full-length diamond aluminum treadplate at front and rear of all hinged doors.

5. 12" x 2" engraved phenolic plastic compartment identification sign in Architect's color selection with 1" letters, mounted above door window.

6. 14" x 24" four-panel glass view window with heater and molded non-metallic inner and outer frame. The heater is to be wired and controlled via the door monitor for continuous service.

7. Padlock/key provisions in the door latch with safety release mechanisms.

8. Kason 1826 Intelli-Vent LED Heated Pressure Relief Ports with Dual Port Vent and Security Light. Locate Two (2) 12" below ceiling on Cooler/Freezer common wall panel and Two (2) 12" below ceiling on Cooler wall panel. If Cooler and Freezer are separate units, locate one on the Freezer wall panel as well, 12" below ceiling and mounted in the door frame assembly. All ports to have separate dedicated electrical connections and be wired for continuous service. Located and installed by Manufacturer.

9. Kason Model No. 1238CQ (unless specified otherwise) Pacesetter Locking Handle QTLC polished chrome with Kason 0485 glow-in-the-dark backplate and turn knob safety release.

10. Manual backup vacuum release mechanism to punch 6" diameter hole in ceiling panel to release vacuum within freezer assembly. Mechanism to include a pull-down handle with freeze-proof hand grip. Handle to have the ability to penetrate and/or punch hole in wall accordingly to assist with opening of door assembly in the event of entrapment (and failure of inside release knob). Release mechanism assembly to be built-in/mounted to panel structural frame to minimize mechanism tear-out and/or failure. Handle to be glow-in-dark yellow with phenolic label "Vacuum Pressure Release." Punch out portion to be replaceable in opening without the use of tools or sealants. Punch out is not to be located directly over interior ramp.

11. Provide Two (2) Edwards 860 Series (or equal) red lens, surface-mounted Xenon Emergency Strobe Beacons. Walk-in manufacturer will install One (1) located in the Kitchen above Walk-In Freezer door (or Cooler door when Freezer is within Cooler in an 'inline' assembly) and provide the second unit loose for installation by Division 26 located in the Cafetorium (Division 26 to coordinate location with Owners and Architect). Division 26 is to provide all conduit and wiring required and interconnect the illuminated Push Button Panic Alarm in the Walk-In Freezer to both Strobe Beacons (***Critical***).

R. Provide refrigeration calculations and refrigeration alarm to meet local jurisdiction code requirements.

S. If air screens or air shields are specified above doors or on the interior of the assembly, the manufacturer must provide adequate blocking in panels to support these components and pre-wired electrical connections. Installer to coordinate location of door closure to not interfere with

air screens or air shields. Clear-VU, swinging door assemblies, are not required if air shields are specified.

T. S/S trim above walk-in assembly to conceal manufacturer ceiling grid.

U. Field-check all horizontal/vertical measurements and conditions at the building before fabrication or delivery of equipment.

V. Walk-in Assemblies to be installed by the PRE-APPROVED INSTALLERS listed below:

1. QBR Refrigeration, 30083 Hwy 90 Blvd., Katy, TX 77493, Mr. Andy Spellins, 713-973-2875, andy.spellins@qbrsales.com

2. Machine Ice, 8915 Sweetwater Ln., Houston, TX 77037, Mr. Will Weaver, 281-448-7823

3. Coolers Inc., 6922 Alder Dr., Houston, TX 77081, Mr. Lee Mamone, 713-665-8886

2.34 WALK-IN COLD STORAGE ASSEMBLY REFRIGERATION SYSTEMS

A. Unit Coolers: specified quantity and model, ceiling-hung by ½" OD nylon bolts with stainless steel washers and nuts. Insert hanger bolts through the plastic sleeve and seal penetration airtight.

1. Unit cooler drain fittings: positioned as indicated on drawings. Installation of cast tee-fittings on drain pan outlet with union and cleanout plug and extension of 1" Type K copper drain line through wall panel to airgap fitting or floor drain under this Section.

2. Slope drain line ½" per foot, trap at the exterior of assembly and turn down into the drain. Manifold drain lines of adjacent compartments wherever possible.

3. Install drain line plastic sleeve through compartment wall, seal around drain line, and install stainless steel escutcheon with setscrews.

4. Electric drain line heater cable (self-regulating 7 watts): on all unit coolers operating below 36°F., installed from coil drain line fitting to wall penetration under this Section. Heater cables: the minimum rating of 15 watts/lineal foot, 208 volts, single phase. Wrap drain line with maximum 2" loop spacing and interwire to unit cooler for continuous operation.

5. Mounted, pre-piped, and pre-wired evaporator components:

a. Sporlan thermostatic expansion valve with external equalizer.

b. Shut-off valve at evaporator suction and liquid lines.

c. Sporlan "Catch-All" refrigerant filter/dehydrator on liquid line.

d. White Rogers 1609-101 adjustable thermostat with remote bulb positioned in return airstream of the evaporator.

e. Electrical disconnect switch in NEMA 4 enclosure.

f. **For any facility within 20 miles of a salt air environment:** Condenser and Evaporators to be built with Electrofin coating to retard salt air deterioration. Coils are to be coated with Technicoat 10-2 coating for protection against a salt air environment.

g. 110° Ambient Temperature Operation.

6. Two (2) fan door activation switches to turn off evaporator coils when the door is opened.

B. Refrigerant System Installation:

1. Refrigerant Lines; Type “L” rigid copper tubing. Fittings: Wrought copper or brass designed for use with high-temperature solder. Piping joints: Made with silver solder (Sil-Fos). Piping: Properly suspended from and anchored to the structure with adjustable hangers 6’ OC maximum. Suction lines: Sized to have a maximum pressure drop of two pounds in medium-temperature systems; one pound in low-temperature systems. Liquid lines: Sized to give maximum pressure to prevent trapping of oil. Insulation on all suction lines: Armaflex insulation by Armstrong. ¾” thick at medium-temp 1” thick at low temp. Refrigerant lines in PVC conduit: Sealed at both ends with Dow Corning 3-6548 silicone RTV foam. The refrigeration system installer will wrap Exterior Refrigerant Lines in the self-fastening jacket of Type 3003-H14 aluminum alloy 0.016-inch thick. Provide aluminum strapping and seals for applying aluminum jackets and covers according to the manufacturer’s recommendations for a completely weather-tight covering.

C. Evacuation and Charging:

1. After completion of the pressure test, the system shall be evacuated using an approved auxiliary vacuum pump. Connections for evacuation: Following the manufacturer’s recommendations.

2. Charging after the initial charge, which is contained in the condensing unit (R448A Non-CFC Ozone Depletion Refrigerant for medium and high temp units, R513A - Non- CFC Ozone Depletion Refrigerant on low temp units) – (Refrigerant must meet District Standards, Industry Standards, and local Codes): given through the charging valve in the high side passing all of the liquid refrigerants through a charging dehydrator. All charging lines and gauges must be purged of air before connection with the system. Refrigerant: unused and shall be delivered in clean containers. After the system is fully charged: start and place it in full operation.

D. Refrigeration system to be installed by the **PRE-APPROVED INSTALLERS** listed below:

1. QBR Refrigeration, Mr. Andy Spellins 30083 Hwy 90 Blvd., Katy, TX 77493, 713.973.2875, andy.spellins@qbrsales.com

2. Machine Ice, Mr. Will Weaver, 8915 Sweetwater Ln., Houston, TX 77037, 281.448.7823

3. Coolers Inc., 6922 Alder Dr, Houston, TX 77081, Mr. Lee Mamone, (713) 665-8886

2.35 PRE-APPROVED KITCHEN EQUIPMENT CONTRACTORS

A. Only the following named Subcontractors and those approved later, if any, are approved for inclusion in the Contractor’s Bid.

B. **Any contractor requesting inclusion within this bid must submit AIA form 305 a minimum of 14 days before the bid date for review or as required by Architect.**

1. Stafford Smith, Mr. JP Garcia, 7129 North Loop East, Houston, TX 77028, Phone: 713.892.5001, Email: jpgarcia@staffordsmith.com

2. Texas Metal Equipment Company, Mr. Travis Andrews, 23518 Coons Road, Tomball, Texas 77375, Phone: 713.466.8722, Email: tandrews@tmeco.com

3. Kirby Restaurant Supply, Mr. Brian Kernan, 809 S. Eastman Road, Longview, Texas 75602, Phone: 903.757.2723, Email: briank@kirbysupply.com

4. Mission Restaurant Supply, Mr. Robert Snoddy, 1126 S. St. Mary's Street, San Antonio, Texas 78210, Phone: 832.970.4020, Email: roberts@missionrs.com

5. Kommercial Kitchens, Mr. Terry Woodard, 13544 East Fwy., Houston, TX 77015, Phone: 409.769.1199, Email: terry@kommercialkitchens.com

6. Supreme Fixtures Co., Inc., Mr. Tim Hampel, 11900 Vinny Ridge Road, P.O. Box 193655, Little Rock, AR 72219, Phone: 501.455.2552, Email: tim@supremefixture.com

7. Amundsen Commercial Kitchens, Mr. Lewis Beville, 105 Montie, Longview, TX 75604, Phone: 903.576.6354, E-mail: lewis@afeok.com

2.36 PRE-APPROVED STAINLESS-STEEL FABRICATION SUPPLIERS

A. Only the following named Subcontractors and those approved later, if any, are approved for inclusion in the Contractor's Bid. Pre-approved fabricators shown below shall not sub-out fabrication.

B. **Any supplier requesting inclusion within this bid must submit AIA form 305 at least 14 days before the bid date for review or as required by Architect.**

1. Texas Metal Equipment Company, Mr. Travis Andrews, 23518 Coons Road, Tomball, Texas 77375, Phone: 713.466.8722, Email: tandrews@tmeco.com

2. Kommercial Kitchens, Mr. Terry Woodard, 13544 East Fwy., Houston, TX 77015, Phone: 832.767.5287, Email: terry@kommercialkitchens.com

3. Mission Restaurant Supply, Mr. Robert Snoddy, 1126 S. St. Mary's Street, San Antonio, Texas 78210, Phone: 832.970.4020, Email: roberts@missionrs.com

4. CSS Manufacturing, Mr. Jared Woodard, 7430 Fairbanks North Houston Rd., Houston, Texas 77040, Phone: 832.444.6311, Email: jared.woodard@css-mfg.com

PART 3 - EXECUTION

3.1 DELIVERY AND INSTALLATION

A. Supervision: Provide a skilled and proficient foreman or supervisor who shall remain on the job during the entire installation.

B. Delivery: Coordinate with the progress of construction and Owner's operation schedules. Unless otherwise instructed and documented by Owner or General Contractor, the following procedures apply:

1. Field-assembled fixed equipment integrated into the structure (e.g., walk-in assemblies, exhaust hoods, drain trench/grate assemblies, conveyor systems, ceiling-mounted

utensil racks) are to be sent to the job site when directed by the General Contractor and installed or protected accordingly.

2. All other Fixed Equipment: delivered after completion of work on adjacent finished ceilings, lighting, finished floor, wall systems (including painting), and painted gas lines.

3. Major Movable Equipment: delivered, when possible, to inventory in a secured area for interim job-site storage or, if the secured area is unavailable when fixed equipment installation/clean-up has been completed.

4. Minor appliances and loose items (e.g., pans, covers, flatware containers, etc.) should be delivered only when the Owner is prepared to receive and inventory such items.

C. Installation: performed by the manufacturer of custom fabricated fixtures.

1. Assemble, square, level, and ready all items for the final utility connections.

2. Cut neatly around obstructions to provide sanitary conditions.

3. Where gaps of ¼" or less occur adjacent to or between equipment, insert rope backing and smoothly apply General Electric construction sealant Series SE-1200 silicone mastic (clear color). Mask both sides of the gap for neat sealant application and remove excess. If space exceeds ¼," neatly install 18-gauge stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement or "Z" clips wherever possible to secure stainless steel trim. Exposed edges or corners of trim: eased and smooth.

4. Refrigeration coil drain line runs to an indirect drain connection greater than 2" from the face of the wall or panel: Either of the following field procedures:

a. Trench the floor and provide a 6" wide x 2" deep 16-gauge stainless steel sloping (-1" to -2") trough from the face of the cooler/freezer wall to the body of the floor sink/floor drain. Trough: turned up 4" at the wall; ¾" flange with ½" turndown at both long sides. Set trough in waterproof mastic and seal 1" OD drain tube penetration into floor sink/floor drain at -2½" BFF. Patch the floor to match adjacent material/surface.

b. Provide 12" x 6" x 2" deep 16-gauge stainless steel condensate pan mounted to cooler/freezer wall at 6" AFF clear. Trench the floor and install a 1" OD drain line from the bottom of the pan to the body of the floor sink/drain. Slope drain line ¼" per foot and seal all connections watertight. Patch the floor to match adjacent material/surface.

D. Protection of Work:

1. Fabricated fixtures: Fiberboard or plywood taped to tops and exposed body panels/components.

2. Manufactured Equipment: Fiberboard or plywood taped as required by equipment shape and installation-access requirements.

3. Prohibited use of equipment: Tool and materials storage, workbench, scaffold, stacking area, etc.

4. Damaged Equipment: Immediately documented and submitted to the Owner with the Contractor's recommendation of action for repair or replacement and its impact on the Project Schedule and Contract Amount, if any.

3.2 CLEAN AND ADJUST

A. Clean up and remove all debris from this Work from the job site as the installation progresses.

B. Lubricate and adjust drawer slides, hinges, and casters.

C. Adjust pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, exhaust hood grilles, etc.

D. Clean or replace faucet aerators and line strainers.

E. Touch-up damage to painted finishes.

F. Start up and check the operation of all refrigeration systems for at least 72 hours before acceptance.

3.3 EQUIPMENT START-UP/DEMONSTRATION

A. Carefully test, adjust, and regulate all equipment following the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments, and performance are in full compliance.

B. Provide the Owner or food service Operators with a thorough operational demonstration of all equipment and furnish instructions for general and specific care and maintenance. Coordinate and schedule selected equipment items and attendees with the Owner at least two weeks before the demonstration starts.

3.4 FINAL OBSERVATION

A. Final observation will be made when the Contractor certifies that they have completed their work, thoroughly reviewed the installation/operation of each item in the contract and found it to comply with the Construction Documents.

B. Repetitive final observations (more than two) and all costs associated with it which may be incurred due to the Contractor's failure to comply with the requirements of this Article will be invoiced to this Contractor on a $70.00/hr and expense basis.

PART 4 - EQUIPMENT SCHEDULE

4.1 REGULARLY MANUFACTURED EQUIPMENT/COMPONENTS: Standard finishes and accessories unless specifically deleted or superseded by the Contract Documents.

4.2 FABRICATED AND FIELD-ASSEMBLED EQUIPMENT: Arrangement and configuration as shown on Plans, Elevations, Detail Drawings, and outlined in Specifications.

4.3 REFER TO DRAWINGS: For unit quantities and plumbing, electrical or mechanical provisions are required, including the manufacturer's optional voltages, wattages, burner capacities, etc.

4.4 REFER TO PART 2 – PRODUCTS: For accessories, fittings, requirements, and procedures related to the listed buy-out and fabricated equipment.

4.5 ALTERNATE MANUFACTURER REQUIREMENTS: A specific product manufactured by the listed pre-approved equals shown under Section 4.7 Food Service Equipment are acceptable only if the specific product can evidence compliance with the specified line items and the contract documents (Refer to Section 1.6; Sub-Section A.).

4.6 RE-USED EXISTING EQUIPMENT IF PROVIDED IN THIS PROJECT

A. Existing equipment scheduled for re-use is to be inventoried and documented that equipment is in operating condition once Kitchen Contractor has taken ownership.

B. Provide pictures of all equipment once inventoried and issue them to the architect to ensure that equipment has not been damaged.

C. Verify the locations of all equipment with the owner.

D. Existing equipment that is to be reused may need parts or accessories for proper and complete operation. Submit a report listing all items with pricing for approval to allow complete installation.

E. Utility disconnection and re-connection: Under Divisions 22 and 26. Kitchen Contractor to verify utility requirements of existing equipment and coordinate with Foodservice Design Professionals (FDP) as required. If utilities shown on FDP drawings do not match the requirements of existing equipment – KEC is to relay that to FDP immediately. All utilities not scheduled for re-use must be capped and covered by required disciplines.

F. Disassembly, removal, transportation, and relocation: under this Section and scheduled with General Contractor. The owner's representative must be present and coordinate the date/time with the owner.

G. Thoroughly clean inside and out before relocation.

H. Review functional parts (e.g., doors, controls, heating elements, compressors, etc.) and submit a report of required repairs and cost estimates. Any finishes or equipment damaged due to construction will be repaired as required.

I. Existing equipment not scheduled for reuse is to be carefully removed/relocated by the Kitchen Contractor per the Owner's direction. Kitchen Contractor to coordinate the date/time with General Contractor and Owner.

J. Removal or replacement of existing equipment is to be scheduled for times of least interruption and inconvenience to the food service operation. Submit the proposed time frame schedule, task sequence, and process for approval before starting work.

K. Kitchen Contractor to verify size and shape for all existing re-used equipment and coordinate with Foodservice Design Professionals (FDP) as required.

L. Any modification(s) required/desired for re-used existing equipment to be verified by the Kitchen Contractor. Before the changes are made, all modifications must be approved by the Owner and Foodservice Design Professionals (FDP).

M. The KEC is to verify and coordinate all the utility requirements with the construction documents as required. Refer to the general specifications regarding conflicts.

4.7 FOOD SERVICE EQUIPMENT

A. All equipment is to have a performance check from factory-authorized personnel. Warranties will begin on the day of the performance check.

B. All equipment and internal components should be of domestic origin where possible.

C. Architect to verify/coordinate the aesthetic options below (Food Service color, material, or signage selections) if these items are provided in this project:

1. Countertops: Stone (stainless steel is provided unless otherwise specified)

2. Tray slides: Corian or Stone (stainless steel is provided unless otherwise specified)

3. Counter fronts: Ceramic tile, 3 Form, or Plastic Laminate

4. Sneeze Guards: Stone insets

5. General color, material and graphic selections:

    a. Display Air Screen Merchandisers – Color selection: Powder Coat or Plastic Laminate (stainless steel is provided unless otherwise specified)

    b. Bakery Display Cases – Color selection: Powder Coat or Plastic Laminate (stainless steel is provided unless otherwise specified)

    c. Pass Thru or Reach-In Holding Cabinets - Color selection: Powder Coat (Mfg.: True) or Plastic Laminate (Mfg.: Traulsen) (Stainless steel is provided unless otherwise specified)

    d. Hanging Heat Lamps – Track and Fixture color selection

    e. Heated Merchandisers

    f. Portable Guide Rails – Stanchion and Belt color selection

    g. Popcorn machine – Signage selection

    h. Bottle Cooler – Signage selection

    i. Graphics Package information

    j. Hot Food Well covers

D. Architect to verify/coordinate the finishes below:

1. Walls: Ceramic Tile, Flat FRP, or Molded FRP (Smooth, Impervious, and easily cleanable as approved by local jurisdiction)

2. Ceilings: Removable Vinyl Face Tile (Smooth, impervious, and easily cleanable as approved by local jurisdiction)

3. Floors: Tile, Epoxy, or Rubberized flooring system (Smooth, impervious, easily cleanable and slip resistant as approved by local jurisdiction) (Coordinate floor tile transition at serving lines)

4. Floors: Walk-in Assembly – Extend kitchen floor flush into Walk-in assembly with coved base

5. Furr Downs above Serving Counters

ITEM NO. 101 AIR SCREEN

QUANTITY 1

Manufacturer:	Mars
Model:	STD248-1UA-OB standard ext.
Size and Shape:	Refer to drawings
Alternate:	Berner

1. Air curtain, STD2 series model, unheated, obsidian black exterior. Size unit to fit door.
2. Air Curtain to include Model #J0023 Controller Kit. Controller kit to come complete with plastic magnetic reed switch, surface mounted, .50 HP max, 115v/1-ph limit switch. The magnet to be mounted on the surface of the door jamb and the door.
3. Confirm clearance above door prior to installation. Air Curtain to accommodate door width and height.
4. 114000 to provide magnetic reed switch kit loose to General Contractor for installation by Division 26. Division 26 to route flexible conduit to j-box on cabinet. Routing to be clean and secured to building.

ITEM NO. 102 COLD STORAGE ASSEMBLY

QUANTITY 1

Manufacturer:	American Panel
Model:	---
Size and Shape:	Refer to drawings
Alternate:	Thermokool

1. Installation to be completed by Factory Approved / Authorized installer. Refer to Section 2.33 Submittal drawings to include factory approval letter or certificate.
2. Manufacturer to review final installation and provide a letter confirming installation meets manufacturer requirements.
3. Assembly to have 9'-6” interior clearance.
4. 304 #3 finish 20 gauge stainless steel finish where exposed, 26 gauge Acrylume where concealed.
5. Factory floor with smooth aluminum finish, recessed in slab 8 1/2". Secure floor to wall assembly with cam-lock assembly. KEC to ensure the floor assembly is level prior to the wearing bed installation. Kitchens finished floor to extend to walk-in.

6. Threshold to be smooth and level with finished floor. - Critical.
7. Interior walls to be .040” aluminum, white embossed texture on walls.
8. Ceiling to be embossed textured .040” aluminum baked white enamel.
9. Two (2) 36" doors. Doors to be 18-gauge stainless steel, type 304 (18-8), #3 finish, with heated perimeter / door jambs / windows and threshold heaters. Each door to be equipped with 3'-0" high diamond tread kick plate on both sides of doors. Mount hinged doors on two (2) Kason model no. 1346 (or equal); polished chrome plated nylon cam-lift hinges. Proper installation of the door systems should allow for the door to self-close and seal around the perimeter of the door opening and at the floor threshold.
10. Provide heated illuminated Push Button Panic Alarm with protective cover and Phenolic Label “PANIC ALARM” for entrapment within Freezer (ADA mounting height). Panic Alarm Encasing is to be stainless steel (not plastic). Manufacturer to pre-run conduit within panel from Panic Alarm to panel above Freezer door (or Cooler door if ‘inline’ assembly) for installation of Emergency Strobe/Horn. Division 26 will provide (2) external Emergency Strobe/Horn Beacons and interconnect the Push Button Panic Alarm to external Beacons (One above the Freezer door and One in the Cafetorium). Division 27 will interconnect the Push Button Panic Alarm to the Building Automation System for Owner notification.
11. Reinforcement as required to be provided above Freezer door (exterior) and panel next to door (handle side - interior) for mounting of Emergency Strobe Beacon, Push Button Panic Alarm and Release Knob.
12. The Cooler will have the standard control panel with standard panic button tied into the Owner's network for notification.
13. Provide Kason model no. 0487 Frost Free Inside release (or equal) for each cold storage door assembly. Fiberglass rod and plastic flange, with safety glow plastic knob, ADA compliant.
14. Manual backup vacuum release mechanism to punch hole in wall assembly to release vacuum within freezer assembly. Mechanism to include a pull-down handle with freeze-proof hand grip. Handle to have the ability to penetrate and/or punch hole in wall accordingly to assist with opening of door assembly in the event of entrapment (and failure of Frost free inside release button). Wall panel to include a knockout section to assist with requirements. Release mechanism assembly to be built-in/mounted to the door assembly structural frame to minimize mechanism tear-out and/or failure. Handle to be painted yellow with phenolic label “Vacuum Pressure Release”.
15. 20-gauge stainless steel, type 304 (18-8), #3 finish trim where adjacent to walls and enclosure panels that extend to 2" above finished ceiling.
16. Freezer One (1) lot LED light fixtures to operate in temperatures to -20 F. Lights to be installed perpendicular to coils.
17. Refrigerator- One (1) lot LED light fixtures. Lights to be installed perpendicular to coils.
18. 3’-0” high diamond tread plate at exposed exterior surfaces. Fasten to wall with stainless steel fasteners.
19. Provide door bumper at doors.
20. Compartments to have all electrical concealed within the walls or located above the ceiling.

21. Provide Manufacturers alarm/control system that includes hi/low limits . Route temperature sensor to be located to the side of evaporator coil.
22. Doors to be provided with CCI Industries, Inc., Clear-VU swinging door assemblies, Alternate: Kason.
23. K.E.C. to provide aluminum coved base to interior of assembly. Provide sealant between floor and wall panels.
24. All holes in assembly to be sealed by factory installer.
25. Kason 1826 Intelli-Vent LED Heated Pressure Relief Ports with Dual Port Vent and Security Light. Locate One (1) 12" below ceiling on cooler/freezer common wall panel and One (1) 12" below ceiling on exterior cooler wall. All ports to have separate dedicated electrical circuits. Pressure relief ports to be wired for continuous service. Relief port to be located and installed by Walk-in Manufacturer.
26. KEC to field verify all horizontal/vertical measurements and conditions at the building prior to fabrication or delivery of equipment.
27. KEC to provide 1-year walk-in panel installation warranty. KEC is responsible for overall install accuracy/quality and quality control of work performed regardless of installer or any field modifications due to building/construction conditions. KEC to provide Letter of Install Approval to FDP upon completed install.
28. Manufacturer to provide One Year Parts and Labor Warranty.
29. Interwiring of temperature monitor panel to master building alarm system or to the Owner's network. Technology department to provide all interfacing of alarm system and with the building alarm system. Conduit from refrigeration system to monitor by Division 26. Temperature Monitor installation at 4'-0" above finished floor. All conduit to be located above walk-in cooler/freezer ceiling. Exposed electrical conduit is not acceptable.
30. Manufacturer Representative to provide training on controls and inside emergency release mechanisms.

ITEM NO. 103.1 REFRIGERATION SYSTEM-LARGE

QUANTITY 1

Manufacturer:	RDT
Model:	ZS1-2 SERIES
Size and Shape:	Refer to drawings

1. Air cooled system.
2. Cooler temperature to be +35 degrees.
3. Freezer temperature to be -10 degrees.
4. EcoSmart system on demand defrost.
5. KE2 Evap Controllers located per Owner requirements.
6. S/S covered housing.
7. A dedicated electrical connection to be provided for heated condensate drain line. Refer to electrical plan for location.
8. All exterior piping to be aluminum wrapped.

9. System to accommodate Item No. 102 Cold Storage Assembly.
10. S/S covered housing mounted to a 24" tall 1/8 galvanized angle iron frame anchored to concrete pad. Provide S/S skirting around frame.
11. Refrigeration rack accommodates 110 ambient temperatures.
12. Mount condensing unit on common exterior rack. Refer to Architectural and Engineering drawings for exact location of remote unit. Coordinate routing of refrigeration lines and conduit with appropriate trades. Heat tape and insulate all drain lines. General Contractor to seal all building penetrations at refrigeration lines.
13. Provide two (2) year parts and labor warranty for all parts and components (including third-party components that may be utilized).

ITEM NO. 104 COLD STORAGE SHELVING

QUANTITY 2

Manufacturer: Metro
Model: Metro Max Q
Size and Shape: Refer to drawings

1. Each unit to be four (4) tiers high with open grid mats.
2. Four (4) 74" post per unit. Provide foot plates at all posts when assembly is supplied with walk-in floor.
3. Refer to drawings for size, width and lengths.
4. Quantity Two (2) to equal One (1) lot: all shelving shown within cold storage assembly.
5. Verify shelving requirements with approved submittal prior to ordering.

ITEM NO. 105 DUNNAGE RACK

QUANTITY 5

Manufacturer: Metro
Model: Bow Tie Series
Size and Shape: Refer to drawings

1. Size as shown.

ITEM NO. 107 DRY STORAGE SHELVING

QUANTITY 1

Manufacturer: Metro
Model: MetroMax Q
Size and Shape: Refer to drawings

1. Each unit to be five (5) tiers high with open grid shelving.
2. Four (4) 86" posts per unit.
3. Quantity One (1) to equal One (1) Lot: all shelving shown within the dry storage room.
4. Refer to drawings for size, width and lengths.
5. Verify shelving requirements with approved submittal prior to ordering.

ITEM NO. 108 CAN RACK

QUANTITY 1

Manufacturer: New Age
Model: 1250CK
Size and Shape: Refer to drawings

1. Three (3) sets 1255, of shelf inserts to accommodate #5 and #10 cans.
2. Four (4) 6" plate casters, (2) swivel with brakes, (2) rigid.

ITEM NO. 109 ICE MAKER WITH BIN

QUANTITY 1

Manufacturer: Manitowoc
Model: IYT-0450A/D570
Size and Shape: Refer to drawings
Alternate: Hoshizaki

1. Energy Star Rated.
2. Stainless steel bin.
3. Stainless steel legs.
4. Provide bin adapter kit as required.
5. Easy Touch Controls, set filter reminders, get error messages/faults, program run/stop times, display serial/model information, view step-by-step cleaning/sanitizing prompts, view warranty expiration timer.
6. Provide Luminice II Virus and Bacteria Inhibitor.
7. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Ice Machine.
8. Cord and plug assembly, coordinate NEMA configuration with electrician.
9. One (1) pre-filter and water filter sized to manufacturers recommendations. Provide two (2) sets of replacement filters. Mount on wall adjacent to ice machine in an easily accessible location.
10. Coordinate cord and cap with receptacle. Water supply to filter to be hard copper plumbed. 72" long flex hose from filter to ice maker with 48" wall restraint cable. Interconnection thru water filter to ice machine and final connection by Division 22. Water filter overflow tube to be strapped to back side of ice machine and extend to 1" above floor sink.

ITEM NO. 110 CLOTHES WASHER

QUANTITY 1

Manufacturer: BY G.C.
Model:
Size and Shape: Refer to drawings

ITEM NO. 110A CLOTHES DRYER

QUANTITY 1

Manufacturer: BY G.C.
Model:
Size and Shape: Refer to drawings

ITEM NO. 111 CHEMICAL SHELF

QUANTITY 1

Manufacturer:	Metro
Model:	MetroMax Q
Size and Shape:	Refer to drawings

1. Each unit to be four (4) tiers high with open grid mats.
2. Four (4) 74" posts per unit.

ITEM NO. 120M DISPOSER - 3HP

QUANTITY 1

Manufacturer:	Salvajor
Model:	300-SA-6.5-ARSS -LD
Size and Shape:	Refer to drawings
Alternate:	In-Sink-Erator

1. Fixed nozzle.
2. Delete standard syphon breakers and provide T & S B-0456-04 vacuum breakers and mount 6” from tabletop to base of breaker.
3. Solenoid valve.
4. Flow control.
5. Model no. ARSS-LD control panel.
6. Auto-reverse.
7. Dejamming tool.
8. Install vacuum breaker in splash
9. S/S cone cover.
10. Perforated silver saver and disposer cone with scrap ring.
11. Two (2) Swirl inlet located in disposer cone at a 45 degree angle.
12. GC to pipe 1/2" cold water to disposer body and swirl inlets. Excess electrical cord to be secured to fabrication as required. Install into counter by section 114000.

ITEM NO. 121 TWO COMPARTMENT SINK W. DISPOSER

QUANTITY 1

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings

1. Top: 14 gauge type 304 S/S marine edge with 2" turndown at free sides.
2. Open base construction.
3. 10" high splash where adjacent to walls/fixtures.
4. Two (2) 24" x 26" x 15" deep sink compartments.
5. One (1) T&S model no. B-0291, splash mount faucet, 18" swing nozzle,LL inlets, for ¾" hot and cold water connections.

6. Two (2) Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece. Provide 18 gauge S/S bracket for drain handle welded to sink bottom.
7. Provide One (1) T&S model no. B-0133-EE-CR-8C pre-rinse, ***two (2)*** B-0108-C spray head, two(2) B-0109-04 18" long wall bracket (dealer to cut to correct length), one (1) additional spray face model no. 108SFRK with ceramic cartridges.
8. 16 gauge S/S undershelf per drawings.
9. Disposer - installed in top integrally welded disposer cone. Notch and punch splash turn back for vacuum breaker. 14 gauge S/S bracket mounted below counter top for disposer control panel ground and polished to match top.
10. 12" deep single post mounted overshelf at 18" above counter top, punched to accommodate spray rinse.
11. Post mounted utensil rack, extend 1-5/8" diameter S/S post from back splash, turn forward 12" and weld full length x 2" x ¼" S/S bar with Component Hardware model no. V-77-4401 S/S sliding hooks at 8" on center. Verify height with owner.
12. One (1) Chicago model no. 305-VBRCF hose bibb and rack mounted on 14 gauge S/S bracket ground and polished to match top. Hose and spray nozzle by owner.
13. Omit rear rail at sink compartments, disposer and front rail at hose bibb.
14. Two (2) "Richlite" ½" thick removable sink covers installed at each sink. Weld ¼" bar stock, set 5/8" below work surface at all four corners for support of sink covers. Two (2) finger holes per board.
15. Provide top and bottom c-channel support storage for sink covers at right or left end of counter.
16. One (1) Edlund model no. S-11 Manual can opener, mounted on raised platform.
17. Flanged feet at front only.
18. Seal at all splash penetrations.

ITEM NO. 123 DISPOSER-3HP

QUANTITY 2

Manufacturer:	Salvajor
Model:	300-CA-18-ARSS -LD
Size and Shape:	Refer to drawings
Alternate:	In-Sink-Erator

1. Fixed nozzle.
2. Delete standard syphon breakers and provide T & S B-0456-04 vacuum breakers and mount 6” from tabletop to base of breaker.
3. Solenoid valve.
4. Flow control.
5. Model no. ARSS-LD control panel.
6. Auto-reverse.
7. Dejamming tool.
8. Install vacuum breaker in splash
9. S/S cone cover.

10. Perforated silver saver and disposer cone with scrap ring.
11. Two (2) Swirl inlet located in disposer cone at a 45 degree angle.
12. GC to pipe 1/2" cold water to disposer body and swirl inlets. Excess electrical cord to be secured to fabrication as required. Install into counter by section 114000.

ITEM NO. 124 WORKTABLE W. OVERSHELF

QUANTITY 2

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings

1. Top: 14 gauge S/S top, type 304, with 2” turndown at all free sides. Provide 10" high backsplash at wall. Provide 10" high back/end splash at wall, equipment, columns, and chases as required.
2. Open base construction.
3. 16 gauge S/S overshelf post mounted 18" above working surface.
4. 16 gauge S/S undershelf.
5. Two (2) 20" W x 20" L drawer assemblies. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C s/s drawer pan.
6. Close back of splash when exposed.

ITEM NO. 125 20 QT. MIXER W. STAND

QUANTITY 1

Manufacturer: Hobart
Model: HL200
Size and Shape: Refer to drawings
Alternate: ---

1. Food mixer, Bench Model, 1/2-HP motor, 20 qt. Capacity.
2. 115/60/1 ph.
3. 15 minute timer.
4. Epoxy enamel finish-bench model.
5. One (1) 20 qt. S/S bowl.
6. One (1) 20 qt. Aluminum "B" flat beater.
7. One (1) 20 qt. S/S "D" wire whip.
8. One (1) 20 qt. "ED" dough hook.
9. One (1) 20 qt. Lexan splash cover.
10. One (1) Caddy model no. T-242 mobile mixer stand, with casters, two (2) with brakes. Secure mixer to table with non-corrosive bolts. Alternate- New Age.
11. Stand to be Pre-Drilled to accommodate Mixer.

ITEM NO. 126 WORKTABLE W. SINK

QUANTITY 2

Manufacturer: Custom Fabricated
Model: ---

Size and Shape: Refer to drawings

1. Top: 14 gauge type 304 S/S, 2" turn down at free sides, 10" high splash on rear or adjacent equipment/walls.
2. Open base construction.
3. 12" deep single post mounted overshelf at 18" above counter top.
4. 16 gauge S/S undershelf.
5. 18 gauge butt jointwall panel from splash to underside of shelf.
6. Two (2) 20" W x 20" L drawer assemblies. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C drawer pan.
7. One (1) 15" x 18" x 10" deep sink compartment. Coordinate location with drain overflow.
8. T&S Brass B-1147, rigid gooseneck, ceramic cartridges, splash faucet for ¾" hot and cold water connections.
9. One (1) Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece
10. Provide 18 gauge S/S bracket for drain handle welded to sink bottom.
11. Omit rear crossrail at sink section.
12. Flanged feet at front legs.

ITEM NO. 128 UTILITY CART

QUANTITY 8

Manufacturer: Lakeside
Model: 522
Size and Shape: Refer to drawings
Alternate: Piper

1. Four (4) N.S.F. approved non-marking casters, Two (2) with brakes.
2. Extended perimeter bumper.

ITEM NO. 130 WORKTABLE NO OVERSHELF

QUANTITY 3

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings

1. Top: 14 gauge type 304 S/S, 6" high backsplash **OR10" high backsplash (Houston)** at walls, 2" turndown at free sides. Close back of splash when exposed.
2. Open base construction.
3. 16 gauge S/S undershelf.
4. One (1) 20" W x 20" L drawer assembly. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C drawer pan.
5. 6" S/S adjustable feet.

ITEM NO. 131 FOOD PROCESSOR

QUANTITY 2

Manufacturer: ROBO COUPE
Model: CL 50 CLR
Size and Shape: Refer to drawings

1. Food Processor, angled continuous feed design, half-size hopper, 11 lb per/min production cap.
2. Stainless steel cutting surfaces, planetary gear transmission, triple safety interlocks, aluminum housing, rubber feet.
3. (6) Plates & Storage Rack, consisting of: (1) SLICE-1/16-SS, (1) SLICE-5/32-SS, (1) SLICE-7/32-SS, (1) SLICE-3/8-SS, (1) SHRED-3/16, (1) DICEGRD-3/8 & (2) WALL-RACK

ITEM NO. 136 BAKER'S TABLE

QUANTITY 1

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings

1. Top: 14 gauge type 304 S/S with 2" square turn down at front, 6" high enclosed splash at sides and rear.
2. Provide finished back at exposed backsplash.
3. 12" deep post mounted overshelf at 18" above counter top.
4. 16 gauge S/S flour trough.
5. Rear rail only.
6. Four (4) lot Rubbermaid no. FG360288WHT ingredient bins.
7. One (1) tier of three (3) 20" x 20" x 5" deep all stainless steel drawers. To be in #18 gauge stainless steel housing having 3/4" radius (vertical) exterior corners. S/S drawer liners.

ITEM NO. 138 PAN RACK

QUANTITY 8

Manufacturer: CresCor
Model: 207-UA-13A
Size and Shape: Refer to drawings

1. Four (4) 5" casters.
2. Adjustable universal slides on 1-1/2" centers.
3. Corner bumpers.

ITEM NO. 139 INSUL. MOBILE PROOFER

QUANTITY 2

Manufacturer: ALTO-SHAAM
Model: 1000-UP/P
Size and Shape: Refer to drawings

1. Insulated proofer/heated cabinet.
2. Field reversible doors.
3. Adjustable universal angles.
4. Four (4) 5" casters, two (2) with brakes.

5. Tempered glass door windows.
6. Key lock handle.
7. Corner bumpers.
8. Cord and plug. Coordinate NEMA configuration with Electrician.
9. Thermometer.

ITEM NO. 151 FIRE PROTECTION SYSTEM

QUANTITY 2

Manufacturer: Ansul
Model: R102
Size and Shape: Refer to drawings

1. Duct and plenum protection to exhaust hood.
2. Surface protection for cooking equipment.
3. Locate remote fire pulls as recommended by Fire Marshal.
4. One (1) lot Mechanical gas valve (maximum diameter as required). Size as required. Furnished by Section 114000, installed by Division 22. Kitchen Equipment Contractor to coordinate location with local Fire Marshal requirements prior to submittal review. All conduits to be recessed within wall, SURFACE MOUNTING WILL NOT BE ACCEPTED.
5. System to meet U.L. 300 requirements.
6. Provide one (1) hand held Type 'K' and ABC 6 liter fire extinguisher per Ansul System, surface wall mounted. Verify mounting locations as required.
7. Exposed pipe threads are unacceptable.
8. All exposed piping to be chrome plated.
9. All hood penetrations to have U.L. listed "Quick Seal". Provide s/s escutcheons at all hood penetrations.
10. Provide phenolic I.D. labels for exhaust hood, remote fire pull, light/fan switches and fire protection system.
11. Provide a manufacturer performance test and report that verifies this system is fully operational.
12. Provide s/s cabinet as shown on plan.
13. Installer to provide one (1) Ansul system per exhaust hood, review drawings and provide systems as required.
14. Install hand held extinguishers, maximum of 3'-2" A.F.F. to top of unit.

ITEM NO. 152 EXHAUST HOOD

QUANTITY 1

Manufacturer: Mod-U-Serve
Model: W-CPB
Size and Shape: Refer to drawings

1. Size and shape as per plan.

2. Supply Air. Recess mounted ceiling plenum box. Provide adjustable dampers that are easily accessible. Coordinate supply air, outside or tempered air (W-CPB) with engineer. Insulated make-up air plenum with 1" thick foil faced fiberglass insulation.Locate supply plenum in ceiling, coordinate location with GC as required.
3. U.L. Listed and fire rated 48” recessed LED lights located within the hood canopy. To meet minimum requirements of 50’ candles of illumination.
4. Simple on/off switches for hood fans and lights to be provided by Division 26. Control panels will not be accepted.
5. Hood to meet requirements of ALL current local Mechanical and local Energy Codes.
6. Collars to be field installed. Coordinate with existing conditions and install as approved by Hood manufacturer.
7. All 18 gauge S/S construction. S/S finish where exposed.
8. For extended cooking line-ups provide Continuous Capture canopies without partitions between hoods.
9. Hood to have insulated front face and ends to allow for ceiling grid attachment where ceiling grid meets hood capture area.
10. S/S filters and grease cup. Provide filter removal tool.
11. ½" diameter steel hanger rods at 4'-0" O.C. maximum to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.
12. All hood penetration to be fire rated and U.L. Listed and sealed with s/s escutcheons.
13. S/S c-channel closure panel from top of hood to ceiling.
14. S/S filler panel between hoods if back-to-back.
15. 4" air space at rear of hood. Provide S/S finished back where rear air space would otherwise be exposed.
16. Ductwork and final connection to hood above ceiling to be by the Mechanical Contractor.
17. Clearance requirement: Where any exterior surface of a hood is installed less than 18" from a combustible or semi-combustible surface, provide a minimum of 4" air space containing a code approved fire resistant material to that surface in a manner as prescribed by the manufacturer of that fire-resistant material. Protective materials provided by 3M Fire Barrier Duct Wrap 615+ and Fry Ware Elite are compliant with state and local mechanical codes. In addition, both systems meet the requirements of the testing standards of ASTM E2336 AND ARE THEREFORE APPROVED TO BE USED IN CLEARANCE REDUCTION APPLICATIONS.
18. Provide Mod-U-Serve model number ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110 degrees F. At the end of the cooking day when the fan is disengaged at the wall switch the thermostat (temperature sensor) will keep the exhaust fan on until the temperature in the exhaust canopy drops below 110 degrees F.
19. Provide minimum 18-gauge stainless steel insulated wall panel 5/8" pan formed, filled with USDA Approved insulation. Extend from top of cove base to underside of hood.

20. Refer to individual hood lengths as shown on drawings for each assembly required. Install at 6'-10" A.F.F. to bottom of hood, coordinate duct and fan requirements with Mechanical Contractor. Interconnect to wall mounted light switch by Division 26. Bulbs for light fixtures to be furnished and installed by Kitchen Equipment Contractor.
21. Mechanical contractor to test and balance exhaust hoods. Balance report to be provided to FDP upon completion.
22. **Special Instruction:** Refer to individual hood and plenum box lengths as shown on drawings for each assembly required. Install bottom of hood at 6'-10" A.F.F. Install plenum boxes recessed and interconnect to wall mounted light switch by Division 26.

ITEM NO. 153 EXHAUST HOOD

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	W-CPB
Size and Shape:	Refer to drawings

1. Size and shape as per plan.
2. Supply Air. Ceiling mounted supply plenum with light fixtures, coordinate conditioned/tempered air with engineer. Locate supply plenum in ceiling, coordinate location with GC as required.
3. Supply Air. Recess mounted ceiling plenum box. Provide adjustable dampers that are easily accessible. Coordinate supply air, outside or tempered air (W-CPB) with engineer. Insulated make-up air plenum with 1" thick foil faced fiberglass insulation. Locate supply plenum in ceiling, coordinate location with GC as required.
4. U.L. Listed and fire rated 48” recessed LED lights located within the hood canopy. To meet minimum requirements of 50’ candles of illumination.
5. Simple on/off switches for hood fans and lights to be provided by Division 26. Control panels will not be accepted.
6. Hood to meet requirements of ALL current local Mechanical and local Energy Codes.
7. Collars to be field installed. Coordinate with existing conditions and install as approved by Hood manufacturer.
8. All 18 gauge S/S construction. S/S finish where exposed.
9. For extended cooking line-ups provide Continuous Capture canopies without partitions between hoods.
10. Hood to have insulated front face and ends to allow for ceiling grid attachment where ceiling grid meets hood capture area.
11. S/S filters and grease cup. Provide filter removal tool.
12. ½" diameter steel hanger rods at 4'-0" O.C. maximum to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.
13. All hood penetration to be fire rated and U.L. Listed and sealed with s/s escutcheons.
14. S/S c-channel closure panel from top of hood to ceiling.
15. S/S filler panel between hoods if back-to-back.

16. 4" air space at rear of hood. Provide S/S finished back where rear air space would otherwise be exposed.
17. Ductwork and final connection to hood above ceiling to be by the Mechanical Contractor.
18. Clearance requirement: Where any exterior surface of a hood is installed less than 18" from a combustible or semi-combustible surface, provide a minimum of 4" air space containing a code approved fire resistant material to that surface in a manner as prescribed by the manufacturer of that fire-resistant material. Protective materials provided by 3M Fire Barrier Duct Wrap 615+ and Fry Ware Elite are compliant with state and local mechanical codes. In addition, both systems meet the requirements of the testing standards of ASTM E2336 AND ARE THEREFORE APPROVED TO BE USED IN CLEARANCE REDUCTION APPLICATIONS.
19. Provide Mod-U-Serve model number ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110 degrees F. At the end of the cooking day when the fan is disengaged at the wall switch the thermostat (temperature sensor) will keep the exhaust fan on until the temperature in the exhaust canopy drops below 110 degrees F.
20. Provide minimum 18-gauge stainless steel insulated wall panel 5/8" pan formed, filled with USDA Approved insulation. Extend from top of cove base to underside of hood.
21. Refer to individual hood lengths as shown on drawings for each assembly required. Install at 6'-10" A.F.F. to bottom of hood, coordinate duct and fan requirements with Mechanical Contractor. Interconnect to wall mounted light switch by Division 26. Bulbs for light fixtures to be furnished and installed by Kitchen Equipment Contractor.
22. Mechanical contractor to test and balance exhaust hoods. Balance report to be provided to FDP upon completion.
23. **Special Instruction:** Refer to individual hood and plenum box lengths as shown on drawings for each assembly required. Install bottom of hood at 6'-10" A.F.F. Install plenum boxes recessed and interconnect to wall mounted light switch by Division 26.

ITEM NO. 161 CONVECTION OVEN- GAS DBL

QUANTITY 2

Manufacturer:	Blodgett
Model:	DFG-200 DBL
Size and Shape:	Refer to drawings
Alternate:	Montague 2-115A

1. S/S front, top and sides.
2. Two (2) 1/2 HP 2-speed motors.
3. Natural gas.
4. SSI-M solid state infinite control with manual timer.
5. Electronic spark ignition.
6. Five (5) oven racks per compartment.
7. Dual pane thermal windows.
8. Simultaneous door operation.

9. Heavy duty casters, two (2) with brakes.
10. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
11. Dedicated gas connections, do not manifold.
12. Shunt trip breaker by Division 26.
13. Provide Eagle model CC-S, Stainless Steel Caster Cradle Stabilizing Device for all mobile production equipment under the exhaust hoods. Coordinate locations with the Owner prior to installation. Quantity One (1) equals One (1) lot. Alternate: Regency Stainless Steel Caster Placement System, model #600Safetyset.

ITEM NO. 163.1 30 GAL. TILT BRAISING PAN- GAS POWER TILT

QUANTITY 1

Manufacturer: Cleveland
Model: SGL30T1
Size and Shape: Refer to drawings

1. PowerPan tilt braising pan with easyDial Controls, selector dial with LED ring, large display screen.
2. Power tilt with spring-assisted cover with vent.
3. S/S construction.
4. Open leg frame.
5. Steamer pan inserts.
6. Pan carrier.
7. Etch marks.
8. Double pantry swing faucet.
9. Flanged feet. Secure rear to floor with non-corrosive anchors.
10. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
11. Trench Liner to consist of:
12. S/S trench liner by 114000. Installation by G.C.
13. IMC/Teddy or Custom Fabricated.
14. Fibergrate: Gray #2 1" Thick, 1 1/2" squares mesh, Quartz grit top. Provide in two (2) equal sections, all ends to be finished ends.
15. 14 gauge s/s liner
16. IMC Teddy model no. BSPC basket strainer with pullout handle and chain.
17. Location of trench liner is critical. G.C. and 114000 to verify location prior to concrete pour. Oversize trench liner block out to accommodate equipment pour path.

ITEM NO. 168 SS WALL CAP

QUANTITY 1

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings

1. 2" square turndown at free ends.
2. Caulk and seal at wall with clear silicone.
3. Eased edges at exposed corners.
4. Coved turn up at full height wall, extended to ceiling.
5. Locate per drawings.
6. GC to provide and install substrate at all wall caps.

ITEM NO. 184 MICROWAVE

QUANTITY 2

Manufacturer: Panasonic
Model: NE-3280
Size and Shape: Refer to drawings

1. **Special Instruction:**Coordinate cord and cap with receptacle.

ITEM NO. 187 PASS-THRU HEATED CABINET- 2DR

QUANTITY 2

Manufacturer: Traulsen
Model: RHF-232WP-HHS
Size and Shape: Refer to drawings

1. S/S interior and exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. EZ-Clean Tray racks, for 18" x 26", 14" x 18" or 12" x 20" pans. Provide a total of (12) levels for each section.
6. 6" high adjustable S/S legs.
7. Furnish startup and Six (6) years parts and labor warranty.
8. Controls mounted on kitchen side.
9. Half height doors hinged as per plan. Stainless doors located on kitchen side and server side**.**
10. Re-hinging feature.
11. Fully welded telescoping S/S trim at wall. Trim is not to be secured to the equipment.
12. Omit plug. Unit to be Hard Wired.
13. **Special Instructions:** Provide opening in wall 2" taller than equipment and 2" wider, KEC to coordinate with GC as required. Trim is not to be secured to the equipment.

ITEM NO. 188 PASS-THRU REFRIGERATOR - 1DR

QUANTITY 2

Manufacturer: Traulsen
Model: RHT-132WPUT
Size and Shape: Refer to drawings

1. S/S interior and exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. EZ-Clean Tray racks, for 18" x 26", 14" x 18" or 12" x 20" pans. Provide a total of (12) levels for each section.
6. 6" high adjustable S/S legs.
7. Furnish start-up and Six (6) year parts and labor warranty.
8. Controls mounted on kitchen side.
9. Five (5) Year compressor warranty.
10. Half height doors hinged as per plan. Stainless doors located on kitchen side and server side.
11. Re-hinging feature.
12. Fully welded telescoping S/S trim at wall. Trim is not to be secured to the equipment.
13. Omit plug. Unit to be Hard Wired.
14. **Special Instruction:** Provide opening in wall 2" taller than equipment and 2" wider, KEC to coordinate with GC as required. Trim is not to be secured to the equipment.

ITEM NO. 196 BACK COUNTER - OPEN BASE

QUANTITY 2

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings

1. Top: 14 gauge type 304 S/S, 2" turn down at free sides. 4" splash where adjacent to equipment and walls.
2. Open base construction.
3. Full length 16 gauge S/S undershelf.
4. 6" S/S adjustable feet.

ITEM NO. 201 SERVING COUNTER

QUANTITY 1

Manufacturer: Mod-U-Serve
Model:
Size and Shape: Refer to drawings
Alternate: CounterCraft

1. Continuous closed base, angle iron frame construction, with utility chase within counter. All electrical conduit and plumbing to be located within utility chase as required. Utility chase to be fully accessible from operator side of counter with removable stainless steel panels.
2. 34" High stainless steel countertop with continuous 32" trayslide. Counter top to be fully welded.

3. Group "E" corian trayslide with 1/4" rounded s/s runners. Trayslide to be supported with finished plywood with white melamine at exposed areas. Trayslide brackets to be fully welded to angle iron frame. Color/Pattern to be coordinated with Owners/Architect
4. Two (2) Hatco heated recesses. Size per drawings.
5. One (1) lot Hatco HWBIBRT-FULD 1200 watt bottom mount insulated hot food wells located per drawings. Recess countertop at hot food wells to accommodate sheet pan. Manifold all drains to one open/close valve located below counter in an accessible location.
6. Two (2) Deck mount single pantry fill faucet T&S Model no. B-0208.
7. Bon Chef hot food well covers, verify color selection with architect.
8. Two (2) Hatco Frost Tops, size and shaper per drawings. Extend drain to floor sink.
9. BGA sneeze guards, mirror finish, single tier at hot food wells and two tier at cold pans/frost tops. All posts to be fully welded to countertop. 3/8" Tempered glass. Glass to be adjustable to accommodate self and full service operation. Heat lamps located at hot food well and heated tops, sized to accommodate equipment.
10. Silverking drop-in ice cream dispenser with integral angled countertop to accommodate ice cream cabinet. S/S lid stop assembly to allow top to remain open at 6" increments.
11. Cashiers station to be integral with counter, lockable cashiers drawer, undershelf to accommodate owners POS System, outlet to accommodate POS system and data line.
12. Closed base cashiers station.
13. Stainless steel undershelves, where possible.
14. Stainless steel legs with adjustable kickplates. Coordinate location of legs, legs to be relocated if located on floor sink assembly.
15. Backerboard at counter front to accommodate glass tile by the Counter MFR. Color/Pattern by Arch/Owner. LED back lighting.
16. Stainless steel louvered panels to be provided on operator's side only at compressor locations. Louvers to be provided per manufacturer's minimum requirements.
17. Provide two (2) convenience outlets per control panel.
18. All electrical to be pre-wired to Two (2) load centers. Electrical to be located in electrical conduit pipe, flex conduit to be kept to a minimum. Exposed conduit will not be accepted. All wiring to be numbered at all junctions, per circuit. Wiring diagram to be provided at each load center door. All receptacles mounted in the counter to be recess mounted and labeled.
19. Dedicated electrical outlets for milk cooler, recessed in end panels.
20. Manifolded drains lead to single 3/4" open/close valve mounted in a 6" to 12" wide stainless steel housing. Drain valve to be located on operator side for ease of access.
21. Counter template to coordinate with servery walls, furr downs, electrical and plumbing locations. KEC to coordinate installation and any site conditions with the Trade/General Contractor as required.
22. Manufacturers are to bid all items per specifications, deviations from the specified manufacturers or fabrication will not be accepted.

ITEM NO. 211 DROP FRONT MILK COOLER - 12 CASE

QUANTITY 2

Manufacturer:	Mod-U-Serve
Model:	MCT-DM2
Size and Shape:	Refer to drawings
Alternate:	Traulsen

1. 18-gauge S/S fully welded liner.
2. 20-gauge S/S exterior.
3. Double pan insulated doors.
4. High pressure insulated foam.
5. 5" casters, two (2) with brakes.
6. ½" S/S nipple drain.
7. Locking mechanism.
8. Cord and plug. NEMA - 5-15P.
9. Corner bumpers.
10. 12 case capacity.
11. Strip curtains.
12. **Special Instruction:** Coordinate location of electrical receptacle so as to not interfere with location of milk dispenser.

ITEM NO. 212 MOBILE TRAY LOWERATOR

QUANTITY 4

Manufacturer:	Piper
Model:	ATCA-ST
Size and Shape:	Refer to drawings
Alternate:	Caddy, Delfield

1. Wrap around bumper.
2. Solid S/S bottom with finger grip.
3. Verify tray size with owner.
4. Four (4) casters, Two (2) with brakes.

ITEM NO. 214 CASH REGISTER

QUANTITY 2

Manufacturer:	Owner Furnished
Model:	---
Size and Shape:	Refer to drawings

ITEM NO. 250.1 CONVEYOR DISHMACHINE W. BUILT-IN BOOSTER

QUANTITY 1

Manufacturer:	Champion
Model:	44 PRO
Size and Shape:	Refer to drawings

1. 44" Conveyor dishmachine with built-in water tempering kit and built-in booster heater.

2. Full display touchscreen control.
3. Prewired 15 KW Electric tank heat.
4. Booster Heater built-in.
5. Programmable, automatic dosing, pumped delime system.
6. Built-in Drain Water Tempering kit. Kit to be installed by Hobart Service.
7. Verify direction of dishmachine with drawings.
8. One (1) Year Extended warranty - One (1) Year parts and labor.
9. One (1) Year Extended warranty on booster heater - One (1) Year parts and labor.
10. Interior Chamber height to be 4" taller than standard.
11. Single Point Connection, including Motors, Controls and Tank Heat, and Internal Booster Heater. Provide kit as required for single point service if noted as 208/240 volt on the Contract Drawings. (480 volt does not require a kit).
12. Two (2) vent cowls with 4 x 16 vent and damper. Provide 18 gauge stainless steel seamless duct risers 6" above finish ceiling for final connection. The duct: trimmed at ceiling with 16 gauge stainless steel flange with all corners welded.
13. One (1) table limit switch with stainless steel cover to conceal back. Provided by Manufacturer / Installed by Div. 26.
14. Four (4) 20"x20" Peg racks.
15. Four (4) 20" x 20" sheet pan racks.
16. Two (2) 20" x 20" combination racks.
17. Vent fan controls.
18. Peak Rate of drain flow = 38 gpm. Division 22 to provide and install backflow preventor between booster heater and filter. Final connection by Division 22. Coordinate location of electrical disconnects on free wall.

ITEM NO. 254 SOILED & CLEAN DISHTABLE

QUANTITY 2

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings

1. Top: 14 gauge type 304 S/S 3" high 1-1/2" rolled rim at free sides. 10" high splash at walls.
2. 14 gauge S/S recessed deposit shelf. Extend shelf through opening to be flush with wall at deposit side. Turn shelf down 2" at front with ¾" return at bottom (either scribed into partition or forming reveal). Shelf: integral with dishtable. Provide Component Hardware E32-4900 drain - extend drain line to floor sink.
3. Modify rolled rim at the operators side of the tray drop window to have a 3" rolled rim.
4. Install Disposer as shown. Notch and punch splash turn back for vacuum breaker. 12 gauge S/S bracket mounted below counter top and polished to match top for disposer control panel.
5. Provide One (1) T&S model no. B-0133-EE pre-rinse, B-0108-C spray head, two (2) B-0109-04 18" long wall bracket (dealer to cut to correct length), one (1) additional spray face model no. 108SFRK with ceramic cartridges.

6. One (1) Chicago model no. 305-VBRCF hose bibb and rack mounted on 12 gauge S/S bracket ground and polished to match top. Hose and spray rinse by owner.
7. One (1) 18" disposer cone.
8. Provide ½" slope in top towards dishmachine per the general specifications.
9. One (1) Cookson Model #ESC10 S/S roll down door at the deposit shelf. The door hood is to be mounted to the face of the wall on the operator's side. Push-up operation.
10. Fully welded s/s window frame and s/s trim on face sides and top (both sides), coordinate with roll down door.
11. S/S corner filler at backsplash; slope to dishtable.
12. S/S cover to conceal table limit switch.
13. 2 1/2" backsplash at dishmachine portion, single thickness of s/s will not be accepted.
14. Anchor flanged feet to floor with non-corrosive bolts. Secure wall mounted equipment / components to in wall grounds or anchor plates. Coordinate installation with the general contractor.

ITEM NO. 255 MOBILE DRYING RACK

QUANTITY 3

Manufacturer: Metro
Model: PR48VX3
Size and Shape: Refer to drawings

1. Four (4) tier, includes two (2) drop-ins and (1) cutting board/tray drying rack, built in Microban antimicrobial product protection.
2. Two (2) no. 5MPX casters per unit.
3. Two (2) no. 5MPBX locking casters per unit.

ITEM NO. 256 POWERWASH SINK

QUANTITY 1

Manufacturer: Power Soak
Model: PSU6
Size and Shape: Refer to drawings

1. Size shape and arranger per plan, elevation, sections, and details.
2. Type 304 stainless steel construction throughout.
3. #14 gauge sinks, drain boards, splashes and channel rims.
4. One low-profile wash jet per every six inches of wash sink length.
5. All wetted parts, including pump housing and impeller are to be stainless steel.
6. 7000-watt heater located in wash sink.
7. Stainless steel Powered Utensil Basket.
8. Wash sink to be 5'-0" unless otherwise specified or noted.
9. Two (2) T&S model no. B-0291, splash mount faucet, 18" swing nozzle, LL inlets, for ¾" hot and cold water connections. Faucets to have antimicrobial finishes. Provide ceramic valves with inline check valves.

10. One (1) Component Hardware KN60-1000BS pre-rinse assembly, 18" long wall bracket (dealer to cut to correct length), one (1) additional spray face with ceramic cartridges. Faucets to have antimicrobial finishes. Provide ceramic valves with inline check valves.
11. Two (2) Fisher model no. 22314-lever handle drain with connected overflow and tailpiece. Provide 18 gauge stainless steel bracket for drain handle welded to sink bottom.
12. Solid state controller and control components.
13. Universal Programming Module completely encapsulated and waterproof.
14. Motor horsepower 3 hp.
15. Zero retained water in the pump or manifold when system is drained
16. Modular design to allow easy access to motor and all major components.
17. Removable Stainless steel sheet pan racks per Irving ISD requirements.
18. 16-gauge stainless steel overshelf per plans. Shelf to be located to accommodate removal of sheet pans.
19. Single bar post mounted utensil rack per plans, extend 1 5/8" diameter stainless steel post from back splash, turn forward 12" and weld full length x 2" x 1/4" stainless steel bar with Component Hardware model no. J-77-4401 stainless steel sliding hooks at 8" on center.
20. Chemical Soap dispenser/pumps.

ITEM NO. 260 HAND SINK - WALL MTD

QUANTITY 7

Manufacturer:	Advance Tabco
Model:	7-PS-50
Size and Shape:	Refer to drawings

1. 20 gauge stainless steel construction.
2. Basket drain and wall bracket.
3. Gooseneck faucet with wrist handles.
4. Soap and towel dispensers by Owner.
5. P-Trap assembly, delete open/close drain valve.
6. Custom fabricated removable end splashes on sides as required by code. Height same as rear splash.
7. Trade contractor to provide temperature adjustment valves as required.

ITEM NO. 601 HOT WATER DISPENSER

QUANTITY 1

Manufacturer:	Hatco
Model:	AWD-12
Size and Shape:	Refer to drawings

1. Water treatment system.
2. Cord and plug assembly, NEMA L6-30P.
3. Plumbing kit.

4. Stainless steel Dormont water disconnect, sized to accommodate equipment. Run from filter to water connection.
5. Provide grommetted hole in countertop to accommodate utility requirements.

ITEM NO. 614 FILL FAUCET

QUANTITY 2

Manufacturer: T & S
Model: B-0610
Size and Shape: Refer to drawings

1. Pot Filler Faucet, splash-mounted, 8" centers, vacuum breaker, flexible S/S hose, 60" long, hooked nozzle with self-closing valve, ½" IPS female inlets, built-in check valves.
2. 12" square 14 ga. S/S wall plate with hose rack with radius corners.
3. Install at 48" A.F.F. by Division 22. Coordinate height of backflow preventor with highest water level of associated equipment.

ITEM NO. 615 MENU MONITOR

QUANTITY 2

Manufacturer: OWNER FURNISHED / CONTRACTOR INSTALLED
Model: ---
Size and Shape: Refer to drawings

ITEM NO. 632 SIX BURNER RANGE

QUANTITY 1

Manufacturer: Vulcan
Model: 36C-6BN
Size and Shape: Refer to drawings

1. Standard oven with two (2) oven racks.
2. Stainless steel front, sides.
3. 3/4" rear gas connection.
4. 10" high stainless steel backguard.
5. Manual rotary ignitor with flame safety device.
6. Heavy duty casters, two (2) with brakes.
7. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
8. Provide Eagle model CC-S, Stainless Steel Caster Cradle Stabilizing Device for all mobile production equipment under the exhaust hoods. Coordinate locations with the Owner prior to installation. Quantity One (1) equals One (1) lot. Alternate: Regency Stainless Steel Caster Placement System, model #600Safetyset.

ITEM NO. 654 TURBO CHEF

QUANTITY 1

Manufacturer: TurboChef
Model: TORNADO 2
Size and Shape: Refer to drawings

1. Rapid cook, speed cook electric, ventless, countertop, stackable oven with 128 cooking profiles, internal catalytic converter, digital display, pull down door with handle, multi-speed convec. Blower.
2. Two (2) 14 ½" x 13 ½" Teflon baskets, oven cleaner, one (1) aluminum paddle & two (2) trigger sprayers.
3. Stainless steel front, top and sides, 4" chrome plated adjustable legs.
4. Provide optional ceramic baking surface.
5. One (1) year parts and labor warranty.

ITEM NO. 711 CONVECTION STEAMER - GAS

QUANTITY 2

Manufacturer: AccuTemp
Model: N61201E060 DBL
Size and Shape: Refer to drawings

1. Double stack twelve (12) pan capacity.
2. Two (2) compartments, Individual connections.
3. Steamer cavity constructed of reinforced 14 ga. 304 stainless steel.
4. Front- mounted drain valve.
5. Low water, high water and overtemp indicator lights.
6. No warranty exclusions for water quality.
7. Stainless Steel, ergo-low support stand with bullet feet.
8. Field stacking kit.
9. Heat shield kits.
10. Field reversible insulated doors.
11. 5' power cord with plug included.
12. One year parts and labor warranty. Lifetime Service & Support Guarantee.
13. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48" Gas Conn. Kit, 48" long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
14. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to steamer,color coded for filtered and non-filtered water.
15. KEC to coordinate filtered and unfiltered water with steamer, do not connect filtered water to unfiltered water connection.
16. Direct water connections and drain.

17. **Special Instruction:** Coordinate location; Floor sink to be outside equipment footprint and outside steam-free zone. Division 26 to provide shunt trip breaker. All power cords are to be secured to equipment so that no power cord is hanging on the floor.

ITEM NO. 804 COMBI OVEN - GAS DBL

QUANTITY 1

Manufacturer:	HENNY PENNY
Model:	FPG621G2/FPG121G2
Size and Shape:	Refer to drawings
Alternate:	Rational ICP 6-FULL / ICP 6-FULL NG

1. Pre-Installation Site Consultation, to verify building utilities and access are in place for the units ordered prior to units being installed on site.
2. 208/240V 1PH
3. Standard door hinging.
4. Six (6) 18" x 26" or twelve (12) 12" x 20" pan capacity, per unit.
5. Standard warranty: 2 year parts and labor, installation inspection/start up.
6. Doors hinged per drawings.
7. Combi-Duo Stacking Kit, mobile.
8. Cleaner Tablets
9. Care Tablets.
10. Fry baskets, qty. 3 per oven.
11. Four hour chef training.
12. Heat shield.
13. Installation Kit "10", per unit, article number 8720.1560US.
14. Rational offers Certified Installation of units by Commercial Kitchens.
15. System installation to be reviewed by an authorized factory installer, provide report confirming installation meets factory's requirements.
16. Reverse Osmosis System: 3M Model Number SGLP200-CL-BP Steel mounting bracket (to mount to stacked unit) OR Wall mounting bracket (to mount to adjacent wall). Div. 22 to provide all interconnection tubing and components required by RO system (Quick disconnect plumbing, cleaning bypass assembly, and connection fittings for standard 3⁄4" water line). Refer to Manufacturer’s Data Sheet for mounting and connection instructions. Copper piping to the RO System by Div. 22. Plastic pipe or reinforced opaque beverage tubing from RO System to equipment by Div. 22. GC to provide wall blocking as required for mounting the system.System incoming water pressure must be between 60 and 100 psig or external pump is required. Div. 22 to confirm, and provide incoming water pressure booster pump as required.
17. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Combi Oven,color coded for filtered and non-filtered water.
18. KEC to coordinate filtered and unfiltered water with Combi Oven, do not connect filtered water to unfiltered water connection.

19. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
20. Provide Eagle model CC-S, Stainless Steel Caster Cradle Stabilizing Device for all mobile production equipment under the exhaust hoods. Coordinate locations with the Owner prior to installation. Quantity One (1) equals One (1) lot. Alternate: Regency Stainless Steel Caster Placement System, model #600Safetyset.
21. Water supply to have shut-off valve and back flow preventer furnished and installed by Division 22. Supply water to interconnect thru water filter and then to each oven. Indirect drain line to be ran outside of the footprint of the unit, coordinate location of the related floor sink.

END OF SECTION 11 40 00

SECTION 11 5200

PROJECTION SCREENS

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Motorized Projection Screen.

B. Motorized Rear Projection Screen.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
01 Manufacturer's specifications and other data needed to prove compliance with specified requirements.
02 Manufacturer's installation instructions.
03 Electrical Requirements
04 Shop drawings: Height of screen, width, and mounting methods.

1.3 WARRANTY

A. Warrant product for one year from failure to operate per specifications and from manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Da-Lite

B. Draper

2.2 MOTORIZED PROJECTION SCREEN

A. Basis of Design: “Da-Lite” Tensioned Advantage Deluxe Electrol

B. 12’ H x 12’ W (nominal viewing surface) electrically operated 120 volt, 1.2 amp projection screen. Two motors, one to operation door and one to operate screen. Motor mounted inside the roller, to be 3 wire with ground, quick reversal type, oiled for life, with automatic thermal overload cutoff, integral gears, capacitor and an electric brake to prevent coasting. To have preset but adjustable limit switches to automatically stop fabric door in the “down” position. The door will lift to a closed position where a micro switch shall cut off the electrical current to the door motor. The roller to be a rigid aluminum.
Locations as shown.

2.3 MOTORIZED REAR PROJECTION SCREEN

A. Based on Da-Lite Tensioned Advantage.

B. Electrically operated 120 V not more than 2.4 amp with a quick connect male plug-in connector on the motor. Shall have specially designed motor mounted inside the roller, to be three wire with ground, quick reversal type, oiled for life, with automatic thermal overload cutout integral gears, capacitor and an electric brake to prevent coasting. To have preset but adjustable limit switches to automatically stop picture surface in the “up” and “down” positions. Junction box shall be externally integrated into the housing making it possible to install the housing and wire to the building’s electrical system during construction, the junction box shall contain a quick connector that is mounted in the housing for easy plug-in connection to the motorized fabric and roller

assembly. The fabric roller to be of rigid steel. Screen to be designed for left- or right-hand motor installation.

C. Projection Viewing Surface. 108”x144” viewing area, Front and Rear Projection Surface. Must be seamless and mildew resistant with black masking borders standard. Each side of the fabric to have tab guide cable system to maintain even lateral tension and hold surface flat. Provide extra screen drop as required for bottom of viewing area at 24” above the Platform floor.

D. Provide custom slat bar with added wight maintains vertical tension on the screen surface. The ends of the slats to be protected by heavy duty plastic cap enclosing a preset adjustable mechanism for screen tensioning. Top, front and back of case to be made of extruded aluminum powder coated white. End caps to be of heavy gauge steel powder coated white. Bottom of case to have a removable access door. Door to be of extruded aluminum powder coated white, Bottom of case to be self-trimmed, with a built-in flange around the bottom of the case, to be complete with integrated low voltage control unit and three position control switch and cover plate.

E. Provide R-232 Interface for connection to Stage Local Sound System and a single station 110-120V AC 3-position wall switch, location as shown.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. Adjust for proper operation.

END OF SECTION

SECTION 11 6143

STAGE CURTAINS

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Curtain at Platform as shown on drawings.

B. Curtain tracks, carriers and accessories required for a complete installation.

1.2 SUBMITTALS

A. Comply with Section 03 3300.

B. Product Data: Submit manufacturer's product data, certifications and supporting information for all products proposed to be furnished to demonstrate compliance with the specified requirements.

C. Shop Drawings:
- 01 Show profile, 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 Manufacturer's complete installation instructions.

E. Manufacturer's complete maintenance instructions.

F. Samples: Submit two (2) samples of each finish for selection by the Architect. Samples must be actual material, 12"x12" minimum size.

PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. Curtains and Drapes:
- 01 Front Curtain and Front Valance:
  - a. Flameproofed (furnish certification) 25 ounce (minimum) velour finish fabric, as manufactured by K-M Mills, Greenville, South Carolina. Equivalent fabrics by other manufacturers should be submitted to the Architect for inclusion by addendum. (Surge seams)
  - b. Full length without seams for entire length of drape.
  - c. 100% fullness
  - d. Colors to be selected by Architect from Manufacturer's standards.
- 02 Side Cyclorama, Rear Cyclorama and Border:
  - a. Princess Velour finish fabric as specified above, 16-ounce weight minimum.
  - b. Full length without seams for entire length of drape.
  - c. Color shall be black.

B. Track:
- 01 Straight Front Curtain Tracks:
  - a. Model No. 170 Besteel series as manufactured by Automatic Devices Co., or equal by H&H Specialties straight draw curtain.
  - b. Minimum 14-gauge galvanized steel construction entirely enclosed except for slot in bottom, each half to be in one continuous piece except where splicing clamps are required.
  - c. 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 rivet, such wheels rolling on two separate parallel treads.
- 03 Cyclorama Curtain Tracks:
  - a. Track shall be two sections with each track operated by separate lines.

b. Model No. 142-R Rig-I-Flex Series Walk-Along Curtain Track System as manufactured by Automatic Devices Co., or equal by H&H Specialties.
c. Curtain tracks shall be of 11-gauge extruded aluminum I-beam construction consisting of a center rib and top, intermediate and bottom flanges.
d. Each curtain carrier shall be spaced on 12" centers and shall be of steel construction to include two solid nylon wheels rolling on two separate parallel treads.
e. Each curtain carrier shall consist of a free-moving plated swivel to accommodate a curtain snap hook.
f. Nylon snap-on spaces shall be attached to wheel supports of curtain carriers.
g. Track shall be rigidly supported from ceiling clamps or hanging clamps as indicated on the Drawings.
h. 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.

C. 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/INSTALLATION

A. Fabricate front curtains in two sections, using multiple widths of 54 inch wide fabric.

B. Curtains shall be 50% fullness. Curtains shall be box pleated on top, 3 1/2 inch 9 pound jute webbing with not less than three rows stitched down, not less than 8 inches with No. 16 thread. Pleats shall be 12 inch o.c.

C. Curtains shall have #3 brass grommets and "S" hooks for attachment to tracks. Borders shall have grommets and tie lines.

D. Curtain hem shall be 5 inches with chain pocket and 2/9 chain. Pocket shall be not less than 1 inch from the bottom of hem. Outside hems of all curtains shall be 4 inches. Border bottom hems shall be 4 inches.

E. Center of each curtain section shall be turned back 1 foot for facing. All side hems shall be 2 inches.

F. All seems shall be 5-thread serge with all salvage material removed.

F. All equipment shall be installed securely by hanging from structural member, as indicated on drawings.

G. Support chains must hang plumb (vertical).

END OF SECTION

SECTION 11 6600

GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES:

A. Wall padding.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's printed specifications and installation instructions.

C. Shop Drawings. Show layout, striping, and insert dimensions, details, anchorage, finishes and components of system.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in protective wrappings, store inside building protected from weather, moisture and soiling.

1.4 QUALITY ASSURANCE

A. Install product under manufacturer's supervision.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Wall Padding
- 01 Buck Terrell Athletics
- 02 Draper
- 03 Porter Equipment Co.
- 04 Performance Systems
- 05 AALCO Manufacturing Co.
- 06 ADP Lemco Gym. Equipment

2.2 MATERIALS

A. Wall padding
- 01 72" high, custom made for locations shown.
- 02 Construct panels with Ethfoam filler covered with flame retardant vinyl-coated nylon fabric.
- 03 Provide inside/outside corner units required for wall configuration.
- 03 Color of fabric as selected by Architect from manufacturer standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall padding, bottom at 4” A.F.F. in locations according to manufacturer's printed installation instructions. Provide cut-outs with inserts where required.

END OF SECTION

SECTION 11 6813

PLAYGROUND

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Playground equipment for 2-12 years and 5-12 years.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data:
   01 Submit cut sheet and/or data information on play equipment, curb access ramp, border edging, fall surfacing and subsurface drainage systems.
   02 Submit color options for applicable equipment from standard available color chars.

C. Certification:
   01 Submit Letter of Certification that Subsurface drainage material meets or exceeds physical properties of specified material.

1.5 QUALITY ASSURANCE

A. Play Equipment and Design Qualifications:
   01 Playground equipment shall comply with all the requirements of CPSC, ASTM, ADA and will be IPEMA certified.
   02 All safety fall zones shall be determined in accordance with ASTM 1487-07 and CPSC Handbook for Public Playground Safety Publication number 325. All playground equipment designs shall be evaluated and signed off by a NPSI certified playground inspector provided by the Contractor.
   03 The Fall Surface systems are to have a written limited lifetime warranty on the sheet drain and a written five (5) year limited warranty (performance) from date of installation.
   04 Play equipment Fall Surface Systems and access curb ramps are to comply with the Americans with Disabilities Act.

B. Playground Manufacturer Qualifications:
   01 The manufacturer of the playground equipment must carry a minimum of 10 million dollars of liability insurance with an AM best rating. The manufacturer of the playground equipment must have a minimum of 10 years' experience in manufacturing commercial playground equipment.

C. Sheet Drain must be backed by Letter of Certification from Manufacturer that the flow rated in the plane of the core meets or exceeds the specified flow given under typical properties PART 2, SECTION A AND B per ASTM D4716.

1.3 APPLICABLE STANDARDS:

A. ASTM F487-07: Standard consumer performance specification for playground equipment for public use.
B. CPSC Handbook for Public Playground Safety, publication number 325.
C. CSA Z614-07 EN 1176-98 (if requested) European Standard for Playground Equipment.
D. All manufactured components must be IPEMA certified.

1.4 CONTRACTOR'S OPTION:

A. Whenever a material, article or piece of equipment is identified on the drawings or in the Specifications by reference to manufacturers' or vendors' names, catalogue numbers or the like, it is so identified for the purpose of establishing a standard, and any material, article or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article or piece of equipment so proposed is, in the opinion of the Architect of equal substance, appearance and function. It shall not be purchased or installed by the Contractor without the Architect's written approval prior to the time of bidding only.

1.5 SUBSTITUTIONS:

A. Written requests for substitutions must be submitted for Architect approval prior to ordering equipment. Requests must include material description, plan layout of equipment and specific play events, and warranty information. An itemized comparison of the proposed substitution must be included with the written request. Equals will only be considered if pre-approved prior to bidding.

B. Request for substitution, when forwarded by the Contractor to the Architect, are understood to mean that the Contactor:
   01. Represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects that specified.
   02. Will provide the same guarantee for the substitution that he would for that specified.

C. Substitutions will not be considered if:
   01. They are indicated or implied on submissions without previous formal request as requied above or
   02. For the implementation, they require a substantial revision of the Contract Documents in order to accommodate their use.
   03. Delay in delivery of specified materials will not be considered justification for substitutions.

PART 2 - PRODUCTS

2.1 PLAYGROUND EQUIPMENT

A. LITTLE TIKES (5~12 Yr. Old) PLAYGROUND EQUIPMENT

Include all components necessary for a complete system even if the item is not listed below:

	PLATE 203 MM/8"
	12" HT. BLACK PLAY CURB
	ACCESS RAMP PLAY CURB
`	TOOL BOX FOR MAINTENANCE
	LABEL AGE APP. (5~12 YRS)
	LABEL, IDENRIFICATIONS STAMPED WITH RIVETS
	MSDS BOOK
	ARCH SIGN SM STD 5~12 YR PNL INDEPT SGL
	WARNING LABEL 3 MESSAGES
100001127	½-DECK-TO ½-DECK. 8"
100001134	DECK-TO-DECK, 8"
116022	WARNING LABEL FOR PLAYGROUND
20006976	DOUBLE-WIDE SLIDE 48" DECK
20007049	SAFETY PANEL, DECK MOUNT
20008193	TOOL BOX KID BUILDERS

200013797	POST PLUS, 10”, 11 GA. GALVANIZED
200013800	POST PLUS, 136”, 11 GA. GALVANIZED
200012812	POST PLUS, 148”, 11 GA. GALVANIZED
200013924	SAFETY LOOP ASSEMBLY
200095003	STONE CLIMBER, 48” DECK
200099926	CIRCLE OVERHEAD CHALLENGE LADDER
200104307	PLAYGROUND STICKER FOR 5~12 YEARS
200107429	STEEL MELODU MAKER PANEL, BELOW DECK
200109865	SAFETY RAIL, 9 BAR W/O TAB FOR WHEEL, DECK MOUNT
200109899	STEEL SEAT PANEL, BELOW DECK, POST MOUNT
200111492	LABEL, IDENTIFICATION STAMPED W/RIVETS
200122438	SPIRAL SLIDE, 64” DECK.
200200135	POST PLUS FOR ARCHES, 13’-8”, GALVANIZED
200200136	POST PLUS FOR ARCHES, 14’-8”, GALVANIZED
200200180	INFINITY CLIMBER GROUND TO DECK
200200485	BONGO PANEL RIGHT MOUNT
200200530	KIT MAINTENANCE KB W/PAINT
200201296	HULA LOOP KB 1625 (64”)
200201306	DECK-TO-DECK STEPS, 16”, WITH SAFETY RAILS
200201866	KB SWOOSH ROOF- FOR USE ON SWAGED POSTS
200202247	BRIDGE CLATER 8’ KB W/SAFETY RAIL
200202483	KB DECK SQUARE LARGE HOLE 11 GA.
200202488	KB DECK ½ SUARE LARGE HOLE 1GA.
200202562	KB TRANSFER STATION 1220 SAFETY RAIL 1 GA.
200203327	KB WAVE SLIDE WITH 2014 HOOD 64”
200245783	STEERING WHEEL, PLASTIC, PANEL MOUNT
200305596	CRATE, LARGE, 14’LX34.5”H
200305597	CRATE, LARGE, 14’LX54.5”H
HW7704-1	HARDWARE FOR CLAMP ELIMINATION (FOR MOUNTING TWO STANDARD DECK SIDES AT THE SANE HEIGHT)

B. LITTLE TIKES (2~12 YR. OLD) PLAYGROUND EQUIPMENT

Include all components necessary for a complete system even if the item is not listed below:

100005274	SQUARE DECK
116022	WARNING LABEL FOR PLAYGROUND
200054510	ARCHED CHAIN CLIMBER, 36” DECK, C/W SAFETY LOOPS
200054614	SAFETY PANEL
200054635	MIRROR BUBBLE PANEL, FLAT TOP, BELOW DECK
200060686	QUAD ROOF
200063639	CRAWL TUNNER, ARCH TOP
200064812	WAVE SLIDE, SINGLE, PLASTIC, 36” DECK
200064815	ELBOW SLIDE, SINGLE, PLASTIC 36” DECK
200065770	SEVEN-STATION PLAY FACTORY
200072938	TOOL BOX R/PLAY BUILDERS
200095000	STONE CLIMBER, 36” DECK
200101172	POST W/CAP F/PB 16.3”
200104305	PLAYGROUND STICKER FOR 2~12 YEARS
4200109105	SQUARE ROOF
200111492	LABEL, IDENTIFICATION STAMPED W/RIVETS
200115331	GEAR PANEL, ARCH, DECK MOUNTED
200166556	ASSY. F/PB POST MT. PLASTIC STEEL WHEEL
200200161	ELBOW SLIDE, LEFT, PLASTIC, 40” DECK
200200270	CURLEY CLIMBER, 36” DECK

200200329	DOUBLE-WIDE SLIDE, PLASTIC, 36” DECK
200200432	TRANSFER STATION, 36” W/SAFETY RAILS
200200531	KIT MAINTENANCE PLAY BUILDER
200202175	PB WAVY RUNG CLIMBER 40”
200202618	PB POST W/CAP 146”
200203249	PB PANEL FLAT WHALE.DOLP/PENG
200305597	CRATE, LARGE 14’LX54.5”H
HW7704-1	HARDWARE FOR CLAMP ELIMINAION (FOR MONTING TWO STANDARD DECK SIDES AT THE SAME HEIGHT)

2.4 MANUFACTURERS/APPROVED PRODUCTS

A. PlayPower Operations.
   01. Local Representative:
   All Play, Inc.
   13903 Van Wall Street
   Houston, Texas 77040
   02 Approved equal.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. The installing contractor shall make an examination of the site of the proposed work and completely familiarize himself with the nature and extent of the work to be encountered. No extra compensation will be allowed for any work made necessary by unusual conditions or obstacles encountered during the progress of the work which conditions or obstacles are readily apparent upon a visit to the site.

B. Slope of the surface shall be 1/8” per foot prior to installation of fall surface system with positive drainage to catch basin.

C. Contractor shall notify the Owner’s representative of any discrepancies between the plans.

A. Contractor shall be responsible for ensuring proper drainage of play area. Water shall not be allowed to stand for greater than a 24 hr period. Should water stand longer than this period of time, contractor shall be responsible for required modifications at no expense to the Owner.

3.2 INSTALLTION

A. The contractor shall provide the filter fabric and drain strips in a manner that allows for proper drainage to catch basin. Filter fabric shall cover the catch basin.

B. All roots, stones and vegetation shall be removed and final grading complete for play area prior to installation of subsurface drainage system.

C. Contractor shall install all equipment according to the manufacturer’s specifications and written instruction.

D. The Contractor shall familiarize himself with complete manufacturer’s products and installation procedures prior to installation of all playground equipment. Consult manufacturer’s representative for product information and warranty information.

END OF SECTION

SECTION 12 2113

HORIZONTAL BLINDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Horizontal window blinds.

1.2 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data. Manufacturer's specifications and technical data.

C. Shop drawings. Show locations of blinds and typical mounting details.

D. Samples. Samples showing manufacturer's full range of colors.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Horizontal blinds shall consist of the following:

01 Headrail: 'U'-shaped with rolled edges, measuring 1 ½" x 2 ¼" x .024" constructed of corrosion resistant steel and providing a sleek low-profile design. Internally fit with components required for specified performance and designed for smooth, quiet, trouble-free operation. Headrail finish to be standard baked on polyester and to coordinate with slats. End caps fitted on headrail for a clean product appearance.

02 Bottom Rail: 1.95" wide x 0.64" thick PVC rectangular in shape. Color-coordinated engineered polymer tape bottoms secure the ladder and cord. Finish to be manufacturer's standard color or stained finish to match slats.

04 Slats: Slats shall be 2" wide x 0.105" thick durable PVC. Furnish not less than nominal 7.2 slats per foot to ensure tight closure and light control. Finish and color selected from manufacturer's standards.

04 Slat Support: Braided ladders of 100% polyester yarn color compatible with slats and spacing of ladder not more than 11".

05 Tilter: Wand-type shall be operated by rounded 3/8 inch diameter constructed of quality hardwood stained or painted to match slats and shall be easily detachable without tools. Tilter can be located at either side of individual blind unit.

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. 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 48 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.

2.2 MANUFACTURERS

01 Hunter Douglas "First Edition 2" Horizontal Alternative Wood Blind"
02 or approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install blinds at 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.

END OF SECTION

SECTION 12 3550

EDUCATIONAL CASEWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Prefinished plastic laminate covered casework.
B. Plastic laminated countertops
C. Solid surface countertops, window sills and where shown.
D. Casework hardware and accessories.
E. Sinks, service fixtures and plumbing connections will be by Plumbing Contractor.

1.4 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings:
   01 Indicate size, material and finish. Show locations and installation procedures, including hardware, service fixtures, trim and other pertinent data for each unit.
   02 Manufacturer's specifications and other data needed to prove compliance with specified requirements.

C. Samples:
   01 Submit selected plastic laminate samples for Architect’s approval.
   02 Submit samples of hardwares to be used for Architect's approval.

D. Maintenance Instructions: Provide preprinted maintenance instructions for the casework hardware.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Catalog Standards: Manufacturer's numbers shown are for identification of casework. Unless modified or otherwise specified, catalog description for indicated number constitutes requirements. The model numbers indicated on the drawings are those of LSI Corporation of America, Inc., Performer System Series L44 overlay door type.

B. Plastic Laminate: High-pressure type, in accordance with all NEMA standards. Color selected from manufacturer's standards.
   01 Laminate plastic sheets to core stock under pressure with adhesive recommended by plastic manufacturer. Cover surfaces as follows:
      a. Exposed Exterior Surfaces - 0.030 inch thickness
      b. Countertops - 0.042 inch
      c. Semi-exposed surfaces - 0.020 inch or melamine
   02 All panels shall be balanced laminations. Use backer sheets where concealed in the finish job.

C. Core:
   01 Typical: 3/4 inch thick particleboard, 45# density, construction grade for all case bodies, bottoms, dividers, slides, doors and drawer fronts
   02 Shelves: 3/4 inch thick veneer core plywood for 36 inch long or less, 1 inch thick veneer core plywood for more than 36 inches long
   03 Case Backs: 1/4 inch thick plywood

D. Hardware:

01 Hinges: heavy duty, five knuckle, type for overlay doors, equal to Stanley No. HT1591, US26D finish. Provide one pair per doors up to 48" height; and one and one-half pair on doors over 48" in height.

02 Pulls: 4" Chrome wire pull type, US 26D finish.

03 Locks (all cabinets except Teachers' Cabinets) shall be equal to national five-pin tumbler grooved key type, nickel plated cylinder and cam with two keys and master keyed where pair of doors are scheduled to receive locks. Locks keyed alike and master keyed as directed by Owner/Architect, Provide catches, equal to Stanley No. 36, on non-active leaf on door pairs.

04 Locks for Teachers' cabinets: Cylinder type lock with removable core; compatible with district core and keying system. Locks shall be furnished by finish hardware supplier and installed by the casework fabricator. Coordinate for proper installation. Re: Section 08 7100 Hardware Set #1.

05 Standard Drawer Slides: full extension, telescopic, self-closing design, steel ball bearing operation with positive in-stop, out-stop. Min 100 lb. dynamic load rating. Equal to K&V #8417.

06 File Drawer Slides: Fill extensions, 3-part progressive opening slide on precision steel ball bearings; minimum 100 lb. dynamic load rating; hold-in feature; positive in/out stops. Equal to K&V # 8500. Provide integral, body mounted molded steel rails for hanging file system for legal and letter file drawers. Cutting or machining of drawer body is not allowed.

07 Catches: for non-locking doors, provide top-mounted magnetic catch for base and wall cabinet doors. Provide two at each tall cabinet door. Equal to EPCO #592; for locking pair of doors, provide an elbow catch on the door leaf not receiving a lock. One required on doors up to 48" tall and two required on doors over 48" tall. Equal to DPCO #1018.

08 Tall cabinet Flush Bolts: furnish flush bolts top and bottom of tall cabinet leaf not receiving lock. Equal to National #1922 surface flush bolt.

09 Adjustable Shelf Supports: twin pin design with anti-tip-up shelf restraints for both ¾" and 1" shelves. Minimum 300 lb. load rating.

10 Grommet: equal to Doug Mockett & Co. Model "XG", 3" diameter, round grommet with flip top series. Provide one grommet at each work station knee space.

07 All hardware and keying system shall be subject to review and approval by the Architect.

E. Plastic Laminate Countertops and Backsplashes:

01 Overall 1 1/4-inch thick with laminate surface and shelf-edge over plywood core with 0.020-inch backer sheet. Provide 3/4 inch thick veneer core plywood core backsplashes, surfaced with 0.035-inch plastic laminate and 0.020 inch backer sheet; 4 inches high, unless otherwise shown. No joint shall occur at sink openings.

F. Solid Surface Countertops, backsplashes and window sills:

01 Corian solid surface

02 Provide continuous length with beveled edge treatment.

03 1 ½" for countertop and 3/4" for window sill.

04 Color as selected from manufacturer's standards.

G. Toe Spaces: Leave toe spaces unfinished for installation of resilient base, unless otherwise shown.

H. End Panels and Filler Strips: Match adjacent case-piece.

I. Edging: Self edged, machine hot glued and pressed, for countertops. Match plastic laminate color. 3 MM PVC edging @ drawing fronts and cabinet doors.

2.2 MANUFACTURERS

A. Casework:

01 Global Casework Manufacturing, Inc.
02 LSI Casework
03 MGC, Inc.

B. Plastic Laminate:
01 Formica
02 Wilson Art
03 Pionite
04 Nevamar

C. Hardware:
01 Stanley
02 National
03 Knape & Vogt
04 Ives

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect the installed work of other trades and verity that such work is complete to the point where this installation may properly commence.

B. Verify that casework and equipment may be installed in strict accordance with the original design, pertinent codes, and regulations, and approved shop drawings.

C. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until such discrepancies have been resolved.

3.2 INSTALLATION

A. Items of casework shall be uncrated, placed in proper location, assembled, leveled, and secured to wall, base or floor, when required, at locations indicated on the Architect's drawings. Apply and adjust hardware.

B. Plumbing and electrical items not specified in this section shall be furnished under the plumbing and electrical section. The casework supplier shall be responsible for all cutouts necessary to receive plumbing items. Provide 'J' clamps to secure sinks to countertops.

C. Installation of wood blocking and other work furnished by the various trades shall be coordinated to assure properly functioning equipment at the completion of the job.

D. Verify lengths of countertops, splashes, and bases. All units with exposed backs, interiors, ends and/or bases shall be plastic clad with colors as selected by the Architect.

E. Provide backsplashes and endsplashes wherever a back or end is next to a wall, whether shown or not.

F. Provide matching fillers and scribes to fit cabinets to partitions and columns.

G. Provide closure panels at top and bottom of wall hung cabinets at corner intersections.

END OF SECTION

SECTION 14 2400

ELEVATOR

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. A hydraulic passenger elevator.

1.2 SUBMITTALS

A. A complete list of all items proposed to be furnished and installed under this Section.

B. Manufacturer's specifications, catalog cuts, and other data to demonstrate compliance with the specified requirements.

C. Complete shop drawings of all work of this Section, showing dimensions and locations of all items including supporting structure and clearances required.

D. Samples of all items and interior finish.

E. Manufacturer's recommended installation procedures which, when approved by the Architect, shall be the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

F. The Contractor shall be responsible for coordinating all dimensions with structure, walls, and adjacent features.

1.3 REFERENCES

A. American National Standards Institute A17.1 Code for Elevators

B. National Electric Code - Latest edition with supplements

C. Americans with Disabilities Act (ADA)

D. State of Texas Revised Civil Statutes, Article 601b, Article 7

E. NFPA 101

1.4 WARRANTY

A. Warrant the elevator equipment and work for one (1) year against defective workmanship and materials.

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. 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 24 months from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ThyssenKrupp Machine-Room-Less Elevator Endura MRL passenger type or equal products approved by Owner.

B. Include all components, including but not limited to pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars and entrances.

B. Any supplier requesting approval shall have a minimum of five years' experience in the installation of similar equipment, and have a maintenance representative in the area with parts stocked.

2.2 MATERIALS

A. Power supply for the elevator apparatus will be as shown on the Electrical drawings.

B. Elevator Description and attributes:

01 Type: Holeless, machine-room-less, beside-the-car, telescoping, dual cylinder.
02 Rated Load: 2100 lb.
03 Rated Speed: 100 feet per minute.
04 Travel: Front at ground and second floor.
05 Operation System: Single automatic
06 Auxiliary Operation: Battery-powered lowering.
07 Door Operation: Automatic microprocessor controlled direct current powered.
08 Clear Car Inside: 5'-8" width x 4'-3 depth
09 3'-0" wide x 7'-0" high entrance, single-slide opening with factory-finished enamel. (See drawings)
10 Signals to be position indicator in car, "light-up" operating buttons.
11 Features:
  a. Stainless steel front with swing panel, baked enamel doors with stainless steel kick plate, telephone compartment with phone, car position indicator, emergency light and alarm bell, selected Dover carpet, oil line shutoff valve, jack cylinder wrapped with corrosion-resistant protective tape, sound isolation couplings, "Oildraulic" silencer, NEMA 1 (fully enclosed) controller cabinet. Emergency Service in accordance with the Safety Code for Elevators and Escalators (ANSI/ASME A17.1) is included.
  b. 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 Houston Building Code for use by the physically handicapped. 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. Cab dimensions shall be 7'-8" x 5'-9" inside clear.
12 Access: Provide keyed access switches and forty keys. Provide Best brand cylinder lock (7 tumbler) keyed to the Owner's master key system.
13 Electrical: 480V/3-Phase/20 HP/60 Hz
14 Provide a pit ladder.

2.3 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 1 year 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. 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 approved 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. Engage a factory-authorized service representative to train Owner’s maintenance personnel to operate, adjust and maintain elevator.

END OF SECTION

Project Manual

for

Cimarron Elementary School Replacement

Galena Park Independent School District

VOL 1II (DIV. 21-33)

Date: Oct.24, 2025

Project No.: 2502 (GPISD B101-101)

Issue for CSP

S. Chu Architects, Inc.

281 / 961-0355

Project Manual

for

Cimarron Elementary School Replacement

Galena Park Independent School District

VOL III (DIV. 21-33)

Oct. 24, 2025
Project No.: 2502(B101-101)

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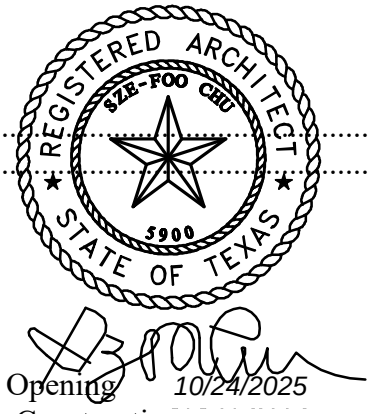
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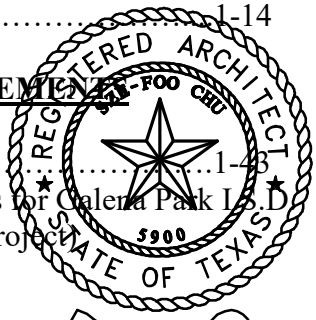
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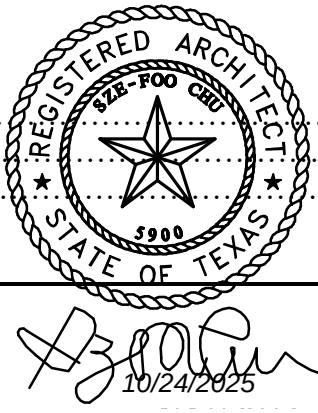
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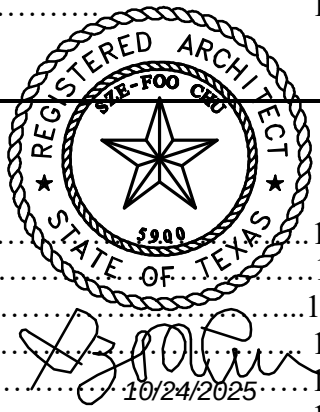
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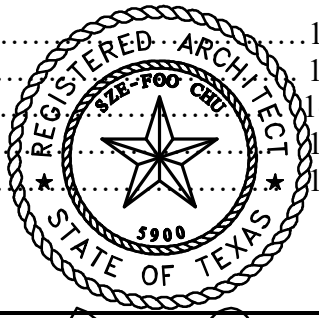
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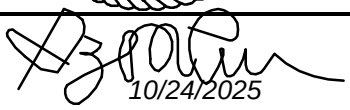
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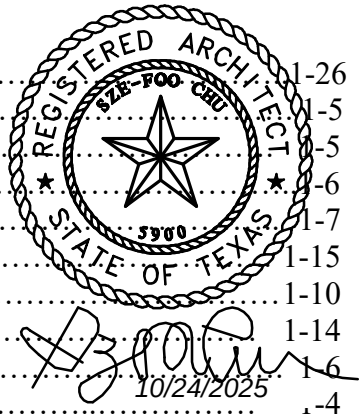
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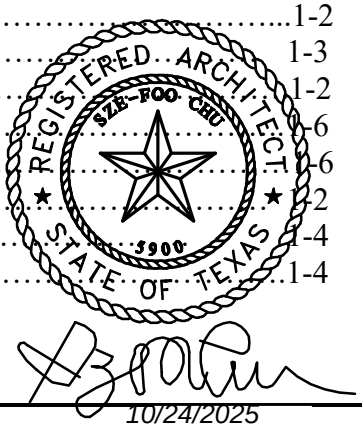
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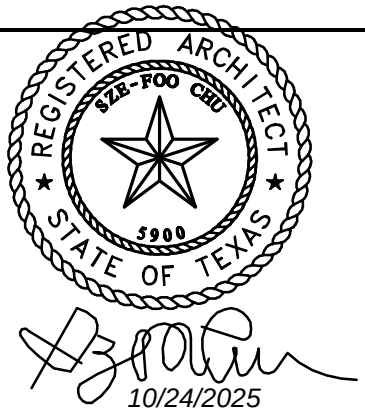


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SECTION 22 00 00 GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.2 INTENT OF DRAWINGS AND SPECIFICATIONS

A. GENERAL: Drawings and Specifications are intended to be complimentary. Any work described in either of them, will be work required under this contract. Where there is a conflict between the Drawings and Specifications it shall be clarified by RFI. Barring clarification prior to bidding the most expensive option shall be included and clarification shall be made during construction. 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. DRAWINGS: The drawings are schematic in nature, intended to 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 and offsets which may be required to fit the system into spaces allotted for them. The Contract shall include these items as required for a complete installation.

C. BASIS OF DESIGN: Equipment that is scheduled is the basis of the design and has been coordinated for space, installation and electrical requirements. Equipment and models from other 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 substitute equipment.

1.3 MATERIALS

A. GENERAL: Manufacturer's printed directions shall be followed for preparing, assembling, installing, erecting and cleaning manufactured materials or equipment, unless otherwise directed. 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. SUBSTITUTION: 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.

C. SUBSTITUTION REQUIREMENTS: 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 drawing to scale showing how the equipment and required access space will fit the available space. Acceptance for bidding does not waive the post bidding requirement for formal submittal and approval.

1.4 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. ELECTRICAL: Power wiring is specified in the Electrical 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. 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. EQUIPMENT AND PIPING SUPPORTS REQUIREMENTS: 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.

1.5 ALTERNATES

A. PROJECT ALTERNATES: 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 plumbing 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.

1.6 PERMITS, FEES AND APPROVALS

A. The contractor shall obtain and pay for all permits and fees to perform his work. He shall 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 from the various insuring and inspection authorities shall also be obtained. Refer to Architectural sections for additional information.

1.7 PLUMBING RELATED UTILITIES

A. WATER, SEWER, STORM AND FIRE SPRINKLER SYSTEMS: These systems will be coordinated by the Civil Engineer with the various utility districts.

B. NATURAL GAS: Contractor shall contact and coordinate with the gas provider to provide service to the building. Installation of the meter shall be in accordance with the gas company's requirements and standards. Where the meter is located in paved areas, leave a minimum 48"x48" (or larger if required by the provider) block-out in the concrete for the gas piping to turn up to grade if the concrete is poured before the gas main is

installed.

1.8 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 additional compensation shall be allowed for failure to fully understand the requirements.

1.9 GUARANTEE

A. All equipment and materials furnished 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.

1.10 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. If, in the opinion of the Architect, objectionable vibration or noise is present, 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.

1.11 INSTALLATION REQUIREMENTS

A. COORDINATION: 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 to coordinate his work with the total project.

B. WORKMANSHIP: 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.

C. CLEAN-UP: Keep area of operations free from accumulation of waste material or rubbish at all times. All piping above accessible ceilings shall be cleaned of cement, plaster and other construction debris prior to being concealed. The parts of the Plumbing installation which are to be painted or insulated shall be thoroughly cleaned of cement, plaster, grease, oil spots and other materials in preparation for painting or insulating.

D. EQUIPMENT PROTECTION: Do not deliver equipment to jobsite until it is actually needed for installation. Protect equipment from damage due to construction activities and the weather. Equipment allowed to stand in weather will be rejected and Contractor is obligated to furnish new equipment at no cost to Owner.

1.12 CLOSEOUT REQUIREMENTS

A. Reference Specification Section 22 00 10.

1.13 SHOP DRAWINGS

A. All submittals shall be submitted in PDF form. Submittal will be reviewed with comments incorporated in this PDF. After final approval, Contractor shall provide a hard copy for use at the project site.

B. 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. Shop drawings shall be approved before installation of the material under consideration. 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.

C. 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. 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:

01 Job name and location.

02 General Contractor's name, address, Project Manager's name and telephone number.

03 Submitting Sub-contractor's name, address, Project Manager's name and telephone number.

04 Suppliers company name, address, salesman's name and telephone number.

D. Shop Drawings are required for but are not limited to the following items:

01	Plumbing Carriers, Drains & Cleanouts	Roof Pipe Supports
02	Grease Trap & Sampling Wells	Water Heaters
03	Pumps	Plumbing Fixtures & Equipment
04	Insulation	Plumbing Pipe, Valves & Fittings
05	Motor Starters	Trap Priming Manifolds
06	Gas Pressure Regulators	Pipe Markers
07	Vibration Isolation	Piping Materials

E. Major equipment in AHU/Mechanical Rooms will not be approved until contractor has submitted and received approved 1/4” scale coordination drawings of mechanical and air handling unit rooms showing sizes of proposed equipment, including access space, and mechanical and electrical equipment also located in the room.

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. SEG 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 SEG at a rate of $125/hr. for these occurrences.

1.14 PLUMBING INSPECTIONS

A. GENERAL: Contractor shall formally request inspections of any and all plumbing systems 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 and final inspection.

B. INSPECTION REPORTS: After each inspection, the Engineer 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 the Architect and Engineer via e-mail.

C. Contractor shall provide a MINIMUM of 48 hour notice prior to requested inspection time, no exceptions.

D. INSPECTION REPORTS: After each inspection, SEG 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 SEG via e-mail. After the signed-off report is returned to SEG, the GENERAL CONTRACTOR shall request a re-inspection by SEG to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, SEG 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 SEG 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. SEG shall be reimbursed $500 by the GENERAL CONTRACTOR for expenses in connection with EACH inspection in addition to the two (2) inspections allowed.

1.15 COMMISSIONING AND TEST AND BALANCE

A. Third party commissioning and an independent test and balance contractor are a part of this project. Commissioning agent and T&B contractor will be under a separate contract directly with GPISD. Refer to included specifications for commissioning and T&B.

B. Plumbing contractor shall complete the pre-function checklist for the various plumbing equipment. Checklists will be supplied by the commissioning agent.

C. Plumbing contractor shall perform system tests as required by the commissioning agent in addition to any that are described in these specifications.

1.16 DEMOLITION

A. The existing building will be demolished. Major equipment shall be offered to the Owner, and if accepted, delivered to his warehouse. If not accepted contractor shall remove refrigerant or other hazardous material from equipment and properly disposed of it with the other construction debris.

END OF SECTION

SECTION 22 00 10 PLUMBING SYSTEMS CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

PART 2 - MATERIALS AND METHODS

2.1 CLOSEOUT REQUIREMENTS

A. AS-BUILT DRAWINGS: 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.

B. CLOSEOUT MANUALS: At completion of job, furnish a complied electronic copy and one hard copy 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. Bind in 3-ring binders with project name.

C. CLOSEOUT DOCUMENTS: Provide a complied electronic copy and one hard copy of the approved submittal with wiring diagrams, sequences, floor plans and graphics updated to the final installation configuration.

2.2 FINAL TESTING

A. 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.

B. UNDERGROUND PIPE CLEANING AND CERTIFICATION: All underground sanitary sewer piping shall be hydro-flushed or rodded prior to substantial completion. After cleaning, contractor shall provide 3rd-party subcontractor to camera and video tape inside of all underground sanitary sewer piping 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. 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. Owner’s Representative and the Engineer shall both be present at smoke testing to review and approve. Both Owner and the Engineer must approve smoke testing of sanitary and vent systems before substantial completion can be granted.

C. GAS PIPING: Perform gas piping test as required by the Texas Railroad Commission and submit competed Texas Pipeline Safety Form PS-86B.

2.3 GUARANTEES AND WARRANTIES

A. GENERAL FOR PLUMBING SYSTEMS: 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.

B. EQUIPMENT SPECIFIC WARRANTIES:

01 For all plumbing equipment with manufacturer warranties exceeding the 1 year guarantee noted in Paragraph 2.3.A., provide manufacturer warranty documentation along with sufficient information to determine the start date of the warranty period, as required by each manufacturer. Where required include:

a. Model number
b. Serial Number
c. In-Service Date
d. Date of Purchase

02 Warranty documentation shall include, but not be limited to, the following items:

a. Electric Water Heaters
b. Gas Water Heaters
c. Circulation Pumps
d. Elevator Sump Pumps
e. Flush Valves & Faucets
f. Valves and Piping Accessories

03 Reference the specification section for each type of equipment for any specific warranty requirements.

2.4 SPARE PARTS

A. GENERAL: 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.

2.5 TRAINING

A. GENERAL: Four hours in the operation and maintenance of installed systems to the Owner’s designated personnel.

END OF SECTION

SECTION 22 05 00 COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

PART 2 - MATERIALS AND METHODS

2.1 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 plumbing 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.

B. Where concrete flooring or paving must be cut to install MEP systems, contractor shall take measures to prevent damaging existing underground services. Contractor shall utilize ground penetrating radar and electrical circuit tracing equipment in the area to be saw cut to determine the existence of underground services. When saw cutting, limit the depth of the cut to less than the thickness of the concrete. Breakout the concrete manually with special care in areas of possible underground services.

2.2 STRUCTURAL STEEL

A. All structural steel used for the purpose of fabricating pipe supports, pipe guides, pipe anchors and equipment supports shall conform to ASTM Designation A-36. All steel used for these purposes shall be new, clean, straight and galvanized.

2.3 CONCRETE PADS

A. All equipment mounted on the floor shall have a concrete housekeeping 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.

2.4 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 copper piping shall have a minimum on one intermediate support if over five feet.

B. HORIZONTAL PIPING SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than listed below:

	Pipe Size	Steel Pipe	Other Pipe
01	1" & Smaller	6 Feet	4 Feet
02	1¼" & 1½"	8 Feet	5 Feet
03	2"	8 Feet	5 Feet
04	2½" to 4"	8 Feet	6 Feet
05	6" and Larger	8 Feet	6 Feet

C. 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. Hangers shall be manufactured by Grinnell or Tolco. Do not use perforated strap.

01 SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

02 MULTIPLE RUNS: Trapeze hangers.

03 BEAM CLAMPS: Grinnell Figure 92 for smaller pipe

04 BEAM CLAMPS: Grinnell Figure 228 (storm or sanitary 8" and larger)

D. 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 UV resistant, polypropylene & stainless steel pipe supports, four foot on center to support piping on the roof. Select for proper weight loading and compatibility with roofing membrane.

E. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel. Provide hot dipped copper clad supports for copper piping.

F. 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.

G. 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.

H. SWAY BRACING: All horizontal no-hub cast iron piping larger than 4” shall have sway bracing per the manufacturer’s recommendations.

2.5 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.

2.6 VALVES, STRAINERS AND DEVICES

A. GENERAL: All pressures shown below are minimum working pressures. Provide memory stops for valves used for throttling service. All devices shall suitable for domestic water service and shall be lead free with NSF/ANSI 61 section 8 (Commercial Hot) and NSF/ANSI 372 listings, where applicable.

B. DOMESTIC WATER BALL VALVE: Provide for 2" and smaller pipe: Bronze body, threaded connection, full port, Teflon seat, stainless steel trim, extension stem for insulation.

C. BUTTERFLY: 2½" and larger, 200# full lug ductile iron type body, EPDM stem seals and seat liner, aluminum bronze disc, 416 stainless steel stem, extended neck for insulated lines, notched top plate with handle for throttling. All valves certified suitable for dead end service with no downstream flange.

D. GATE VALVE: Provide for copper pipe 2½" and larger only: 150# bronze, threaded connection, union bonnet, solid wedge and rising stem. 200 psig butterfly valve with lever-lock operator shall be acceptable in lieu of gate valve.

E. NATURAL GAS VALVES: Ball type ANSI B16.33-1981, ANSI B16.38-1978 or UL 842-1980 approved and rated at the gas pressure of application.

F. SHUTOFF VALVE AT GAS METER: Rockwell plug valve with grease fittings

G. CHECK: 2" and under, 125# bronze body, bronze swing check with Teflon seat; 2½" and over 125# iron body, flanged, bronze trim.

H. UNIONS: Brass insert, ground joint

I. INSULATION PROVISIONS: Valves on insulated lines shall have stems extending through insulation.

J. BACKFLOW PREVENTER: Provide Reduced Pressure Zone Assembly type backflow preventer at makeup water connection to building chilled and heating water systems.

01 2” and smaller shall be lead free, cast bronze with strainer, ball valves and stainless steel check valves and air gap drain fitting; WATTS LF-909M1-QT-S-HW or equal.

02 2.5” and larger shall be lead free, cast iron with OS&Y isolation valves and air gap drain fitting; WATTS LF909-OSY or equal.

K. INSTALLATION: Ball and butterfly 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.

L. ACCEPTABLE MANUFACTURERS: Kitz, Milwaukee, Nibco and Viega

2.7 MOTORS

A. GENERAL: This section applies to motors larger than 1/2 horsepower and not part of an assembly. 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 be designed for this application.

B. ENCLOSURE: Drip proof for locations protected from the weather; totally enclosed fan cooled for exposure to weather or installed inside air handling units or serving pumps. 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. All motors for use with a VFD shall be inverter duty.

D. EFFICIENCY: Motors shall be premium efficiency type and have all copper windings.

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. Provide sleeve bearings with oil cups for units requiring minimum noise level. Average bearing life shall be 150,000 hours.

I. ACCEPTABLE MANUFACTURERS: Allis Chalmers, Baldor, Century, General Electric, Marathon, Reliance, Siemens, US Motors and Westinghouse.

2.8 VALVE INSTALLATION

A. Ball and butterfly 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. All valves above a ceiling shall be installed within 24” of the ceiling.

2.9 EQUIPMENT IDENTIFICATION

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. The following equipment shall be marked with decal or stencil painted, 3" high letters:

01 Water Heaters

C. Install factory made arrow marker on piping in Mechanical Rooms.

2.10 PIPE IDENTIFICATION

A. Identify all new and existing system piping. Use EMED Co. Kwik-Koil Pipe Markers of appropriate legend and background color, complete with direction arrow. Select

appropriate size for O.D. of piping including insulation. Markers or arrows not wrapping the full circumference of the pipe shall be tie wrapped in place, otherwise taped at each end.

B. Apply markers as follows:

01 At input and output of each piece of equipment inside building.

02 At each valve not in a mechanical room.

03 At every point a pipe enters or exits a wall or floor.

04 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:

01 Domestic Hot Water

02 Domestic Cold Water

03 Domestic Hot Water Return

04 Natural Gas

05 Compressed Air

06 Fire Standpipe

2.11 VALVE IDENTIFICATION

A. GENERAL: Each valve 2" and larger, except those located adjacent to the equipment they serve, shall have a tag of .050-inch-thick by 1½" diameter brass, stamped or engraved with the valve number and service symbol. Attach tag to the valve with stainless steel chain.

B. SCHEDULE: 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. Mark the symbol and number of all valves, exactly as the valves are tagged on the "As Built" Drawings. Provide one valve schedule, as above, installed in aluminum frame with plastic shield, and mount on wall of main equipment room.

C. CEILING IDENTIFICATION: For valves above accessible ceilings, glue red star on ceiling tee intersection nearest the valve location.

2.12 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. All above grade gas piping shall 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)

01 Gas Piping Yellow

02 Fire System Red

2.13 HEAT TRACE SYSTEM

A. GENERAL: Install freeze protection system on plumbing piping where noted on the Drawings.

B. MATERIALS: Raychem XL-Trace self-regulating heat tape, Catalog 5XL2-CR/CT, 5 watts per foot, 208 volts. Provide power connection kit for plugging into a receptacle, end seal and thermostat.

C. INSTALLATION: Install straight along bare pipe wrapping around valves. Tie wrap to pipe at short intervals. Installation shall be in accordance with manufacturers recommendations.

2.14 ACCESS PANELS

A. REQUIRED: Panels of size and location to provide access to all concealed valves and equipment. Obtain Architect's approval of locations and type before ordering.

B. SIZE: Minimum 12" x 12", larger where required for adequate service access.

C. WALL MOUNTED: Best suited for surface materials in which installed, constructed of 12-gauge stainless steel, complete with anchor straps, concealed hinges, dust tight door and cylinder lock, all doors keyed alike. Prime coated steel is acceptable for installation in painted surfaces. U. L. Listed for 1-1/2 hour rating.

D. ACCEPTABLE MANUFACTURERS: Acudor, Mi-Fab and Zurn.

2.15 CLEANING DOMESTIC WATER PIPING

A. Flush thoroughly, then sterilize with chlorine solution for minimum 24 hours. Strength of chlorine solution shall be a minimum dosage 50 ppm, and methods must comply with local Code and Health Authorities. System shall be flushed afterwards with clean water until remaining chlorine content is less than 0.2 ppm. At completion, there must be no discernible odor. Post warnings until sterilization is complete.

2.16 TESTING WATER 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. SEG to witness and approve all testing. If piping is concealed prior to SEG witnessing and approving testing, contractor shall expose entire piping system and re-test piping for SEG to witness and approve.

B. PRESSURE TEST METHOD: Hydraulically test domestic water piping with a minimum test pressure of 125 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.

2.17 TESTING SANITARY AND STORM 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. SEG to witness and approve all testing. If piping is concealed prior to SEG witnessing and approving testing, contractor shall expose entire piping system and re-test piping for SEG 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 without 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

01 Initial open trench underground piping tested to 10-foot head for 8 hours. SEG will inspect pipe installation, approve/reject test and approve installation for backfill.

02 Pipe to remain full of water through backfill and compaction.

03 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.

04 Prior to concrete pour, Architect's CA (already on site for concrete pour) and Contractor to check water levels and CA to approve/reject test for concrete pour.

05 After concrete is poured and dry, Architect's CA or SEG to check water levels and approve/reject pipe tests accordingly. Test shall not be removed until approval is granted by A/E team.

06 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.

E. UNDERGROUND PIPE CLEANING AND CERTIFICATION: All underground sanitary sewer piping shall be hydro-flushed or rodded prior to substantial completion. After cleaning, contractor shall provide 3rd-party subcontractor to camera and record inside of all underground sanitary sewer piping and provide video file 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/record those areas to confirm proper installation at no cost to the Owner. 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. Owner's Representative and the Engineer shall both be present at smoke testing to review and approve. Both Owner and the Engineer must approve smoke testing of sanitary and vent systems before substantial completion can be granted.

2.18 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. All

testing shall be witnessed and approved by the Engineer and the Owner's Representative.

B. GAS PIPING TESTING

01 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.

02 Test joints with a soap solution while lines are under pressure. Repair any leaks that are detected.

03 Final gas test shall be with a 24-inch column of mercury or 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 Engineer and the Owner's Representative for a minimum of 30 minutes with no drop in pressure.

04 Perform gas piping test as required by the Texas Railroad Commission and submit competed Texas Pipeline Safety Form PS-86B.

05 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.

2.19 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, paved areas and unventilated walls and ceiling cavities. Pipes through grade beams shall be sleeved per structural engineer's drawings. As a minimum pipe through structure shall be wrapped with 1" thick closed cell pipe insulation.

B. Sleeves through floors and through fire walls shall be fire caulked or otherwise protected to maintain the fire rating of the wall.

C. Provide 6" schedule 40 PVC irrigation sleeves buried 24" below finished grade and extended a minimum 18" beyond the curb or concrete edge on each side where indicated on the drawings. Provide brass survey markers permanently affixed to the top of the curb or pavement edges at each end. Stamp each marker with "IRRIGATION SLEEVE".

2.20 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 3".

2.21 DIELECTRIC UNIONS

A. Provide dielectric insulating unions at all connections between dissimilar metals.

2.22 MISCELLANEOUS COPPER PIPING

A. GENERAL: Provide all required piping not specifically shown on the drawings but necessary for the proper operation of the systems and equipment. Piping materials, methods of installation, fittings, valves, etc., shall conform 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. Provide a valve at each and every connection between Plumbing and HVAC Systems.

C. TRAP PRIMER PIPING: Use Type K copper. Piping below slab or in contact with concrete shall be installed in a protective sleeve.

D. MISCELLANEOUS DRAINS: Provide drain line to floor drain from backflow preventers, relief valves and other plumbing equipment with automatic drains.

2.23 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.

2.24 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:

01 For non-drainage lines backfill with approved backfill material to 95% standard proctor, by hand compaction.

02 For drainage lines, the lower 12” shall be backfilled with cement-stabilized sand 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 1/2 the diameter of the 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.

03 Backfill for pipe in City Property must comply with City requirements.

D. SAFETY SYSTEMS: Refer to Architectural Sections for additional requirements.

2.25 EXCAVATIONS, TRENCHING AND SHORING

A. GENERAL: The sides of all excavations for installation of underground piping shall be shored, sheeted, braced, sloped or otherwise supported by means of sufficient strength to protect workmen and other individuals within or near the excavation.

B. PREPARATION

01 Prior to opening any excavation, review the Site Survey provided by the Owner to determine the locations of existing underground utilities. Contact utility companies for additional information and marking of underground utilities. When underground piping is encountered, provide suitable supports to protect the existing piping and prevent injury to workmen.

02 Prior to opening any excavation, locate and make safe trees, boulders and other surface encumbrances located so as to create a hazard to workmen involved in the excavation work at any time during the operation.

C. SLOPING: The sides of trenches five feet or more in depth protected by sloping shall have an angle of repose of 1:1 (45°), or shallower if water conditions, silty materials, loose boulders or areas where erosion and slide planes appear.

01 SHORING: The sides of trenches five feet to ten feet in depth and three feet wide protected by shoring, shall have shoring members with minimum size and maximum spacing as follows:

	TYPE	SIZE	SPACING
02			
03	Uprights	2" x 4"	Close sheeting
04	Stringers	4" x 6"	4 feet
05	Cross braces	4" x 4"	4 feet vertical
06	Cross braces	4" x 4"	6 feet horizontal

07 Trenches from three to six feet wide shall have 4" x 6" cross braces.

D. MATERIALS: All materials shall be in good serviceable condition, sound, free from large or loose knots and of proper dimensions.

E. MATERIAL STORAGE: All excavated material and shoring lumber shall be stored a minimum of two feet away from the edge of the excavation.

F. WEEP HOLES: Tight sheeting and sheet piling shall have sufficient weep holes and drains to eliminate ground water pressure on the sheeting.

G. SURFACE WATER: Diversion ditches, dikes or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

H. MACHINERY: Do not operate machinery or place heavy objects adjacent to the excavation unless the shoring and bracing is strengthened to resist the extra pressure due to such superimposed loads.

I. BARRIERS: Trenches and other excavations left unattended shall have lighted barriers

to mark their presence and prevent injury to workmen and other people.

J. BRIDGES: Provide walkways and/or bridges with standard guard rails where workmen or equipment are required or permitted to cross over trenches or other excavations.

K. EXITS: Where workmen are required to be in trenches four or more feet deep, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than 25 feet of lateral travel.

L. CODES: Additional requirements as listed in Chapter XVII of the Occupational Safety and Health Administration Code shall be complied with.

END OF SECTION

SECTION 22 07 00 PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 GENERAL REQUIREMENTS

A. Install all insulation in conformance with manufacturer's recommendations and these specifications.

B. Insulation materials manufactured by the following list of companies will be acceptable provided their materials conform to these specifications: Armstrong, Armacell, CertainTeed, Insulphen Phenolic Foam, Manville and Owens-Corning.

C. Flame Spread and Smoke Requirements:

01 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.

02 All materials containers shall have a U. L. Label.

D. At each pipe support point, provide 10” long, formed 16 gauge galvanized sheet metal saddle. For piping 1½” and larger, install a hard section of Koolphen K phenolic foam pipe insulation the same length as the pipe saddle. Seal and finish to match adjoining insulation.

E. 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. Cover is not required in mechanical or AHU rooms.

PART 2 - MATERIALS AND METHODS

2.1 DOMESTIC COLD WATER PIPING

A. GENERAL: Insulate all water piping outside and above grade, in exterior walls, within eight feet of exterior walls, central mechanical and boiler room piping, piping inside the

building but outside the building insulation and all piping subject to condensation.

B. MATERIALS FOR PIPING INSIDE BUILDING: 1" thick factory molded pipe covering insulation made with fiberglass having a density not less than 3 pounds per cubic foot. Conductivity (k) shall be .25 or less at 100° mean temperature difference. Insulation shall have a factory attached fire retardant jacket.

C. MATERIALS FOR PIPING OUTSIDE BUILDING: Insulate piping outside including backflow preventers outside with 1" thick Molded Koolphen K phenolic foam pipe insulation. Install .010" stainless steel protective jacket. 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.

D. INSTALLATION: Install insulation over pipe and carefully connect seal 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. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. Apply Foster 95-50 or Childers CP-76 insulation joint sealant in phenolic insulation longitudinal and butt joints to prevent moisture ingress.

E. FITTINGS: Insulate fittings with pre-molded cover of same materials and thickness as pipe covering. Coat all fittings and elbows with anti-fungal Foster 30-80AF vapor barrier coating and 10x10 Childers Chil Glas #10 or Foster Mast a Fab reinforcing mesh. Finish all joints and seams smooth and even.

2.2 DOMESTIC HOT WATER PIPING

A. GENERAL: Insulate all hot water supply and return piping, including booster heater piping and tempered water piping.

B. MATERIALS: 1" thick factory molded pipe covering insulation made with fiberglass having a density not less than 3 pounds per cubic foot. Conductivity (k) shall be .25 or less at 100° mean temperature difference. Insulation shall have a factory attached fire retardant jacket.

C. EXECUTION: Secure all laps and joints with staples at 4" on center. Provide 3" butt strips at each joint between sections. Insulate fittings with pre-molded cover of same materials and thickness as pipe covering.

2.3 STORM DRAINAGE PIPING ABOVE SLAB

A. GENERAL: Insulate horizontal and vertical piping including roof drain bodies, including overflow drains and piping.

B. MATERIALS: 1½" thick flexible fiberglass blanket with vapor barrier or 1" thick fiberglass pipe insulation with vapor barrier. Insulated piping exposed to view shall be insulated with pipe insulation.

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. 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, shall have aluminum jacketing per specification.

2.4 SANITARY DRAIN PIPING ABOVE GRADE

A. GENERAL: Insulate horizontal piping, floor drain bodies, elbow at drain, first elbow that turns down and all piping in ceiling plenums of sanitary system serving floor and hub drains receiving condensate from air conditioning and refrigeration equipment.

B. MATERIALS: 1½" thick flexible fiberglass blanket with vapor barrier or 1/2" thick pipe insulation with vapor barrier. Insulated piping exposed to view shall be insulated with pipe insulation.

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. Finish all joints and seams smooth and even. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab.

2.5 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.

2.6 FIRE SPRINKLER PIPING

A. Insulate all water piping outside and above grade, in exterior walls, within two feet of exterior walls, and piping inside the building but outside the building insulation (i.e. above insulation on ceiling) 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 inside mechanical rooms with local space heater or boiler need not be insulated.

2.7 LAP AND JOINT ATTACHMENT

A. Self-sealing type jackets will be acceptable provided the laps are sealed per the manufacturers recommendations.

END OF SECTION

SECTION 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for plumbing systems, assemblies, and equipment.

B. Related Sections:

01 Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

C. The cost of the Commissioning Authority shall be paid directly by the Owner.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority

C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting and balancing review and coordination meetings.

D. Participate in plumbing systems, assemblies, equipment and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.5 CxA'S RESPONSIBILITIES

A. A. Provide project-specific construction checklists and commissioning process test procedures for actual plumbing systems, assemblies, equipment and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing and adjusting work is complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.6 COMMISSIONING DOCUMENTATION

A. Contractor shall provide the following information to the CxA for inclusion in the commissioning plan:

01 Submittals, systems manuals, and other documents and reports.

02 Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.

03 Schedule for completing manufacturer's prestart and startup checklists for plumbing systems, assemblies, equipment and components to be verified and tested.

04 Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.

05 Notification that plumbing systems, subsystems, equipment and associated controls are ready for testing.

06 Test and inspection reports and certificates.

07 Corrective action documents.

08 Testing and adjusting reports.

1.7 SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation and tools to perform commissioning test at the direction of the CxA.

B. Scope of plumbing testing shall include water heating systems.

C. Tests will be performed using design conditions whenever possible.

D. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

E. The CxA may direct that set points be altered when simulating conditions is not practical.

3.2 TESTING PREPARATION

A. Contractor shall certify that plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Contractor shall set systems, subsystems and equipment into operating mode to be tested.

C. Inspect and verify the position of each device and interlock identified on checklists.

D. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.3 PLUMBING SYSTEMS, SUB-SYSTEMS AND EQUIPMENT TESTING PROCEDURES

A. Water Heater Testing and Acceptance Procedures: Testing requirements are specified in Division 22. Provide submittals, test data, inspector record, and boiler certification to the CxA.

01 Perform visual inspection of installation including electrical connections.

02 Perform gas system check as required by the boiler code.

03 Test operating function of safeties and relief valves.

04 Test operational control including circulation pumps and time clocks.

END OF SECTION

SECTION 22 11 00 BUILDING WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 GENERAL REQUIREMENTS

A. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops.

B. Piping shall be concealed in wall, chases and above ceilings except in the vicinity of equipment such as water heaters.

C. 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.

D. Piping shown underground shall be buried a minimum of 12 inches to top of pipe.

E. All materials shall conform to the City Building Code. All piping, fittings and valves shall be manufactured in the United States of America.

PART 2 - MATERIALS

2.1 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: Type "K" copper rigid water tubing per ASTM B-42 and ASTM B-88, with solder type ASME B 16.18 cast bronze, or ASTM B 16.22 wrought copper alloy fittings. Piping in contact with concrete shall be protected with Benjamin Foster 60-25 mastic or be PVC coated.

C. INSTALLATION: Clean inside and outside of all tubing and fittings. Make up joints 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.

D. TESTING: Test in accordance with recommendations of AWWA.

2.2 WATER ENTRY

A. GENERAL: This paragraph related to all domestic water entry into the building.

B. MATERIALS:

01 Riser shall be composed of a single extended 90 degree fitting of fabricated 304 stainless steel pipe, maximum working pressure 200psi (14 bar). The fitting shall either have a MNPT on the inlet (underground) side and grooved connection on the outlet (building) side.

02 The riser shall be UL listed and NSF Approved for domestic water service.

03 The riser shall have a 5ft rise and 6ft run.

C. INSTALLATION:

01 Reference the drawings for an installation detail.

2.3 INTERIOR DOMESTIC WATER

A. GENERAL: This paragraph relates to all piping inside of building.

B. MATERIALS:

01 All piping shall be hard drawn, copper water tube, Type "L" per ASTM B-88, with solder type ASME B 16.18 cast bronze, or ASTM B 16.22 wrought copper alloy fittings, made up with lead-free solder. Victaulic copper piping connection system or Grinnell grooved system may be used for sizes 3” and larger.

02 All individual branches serving fixtures, from surface of walls to connections to fixtures or equipment, shall be chrome plated.

03 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.

04 Press Fit System is acceptable.

05 Below grade water piping may be soft drawn copper without joint below slab. Note only allowed where specifically shown and must be sleeved.

C. AIR CHAMBERS: Install in each water branch, at each fixture and each piece of water supplied equipment. Locate in chases or walls as close to fixture or equipment as possible. Chambers shall be minimum 24" high Type L copper.

D. WATER HAMMER ARRESTERS: Provide on both hot and cold water branches in addition to air chambers. Arresters shall be Precision Plumbing Products, Inc. or Sioux Chief, size and location shall be based on pipe size, fixture unit count and manufacturer’s recommendation.

01 All water hammer arresters shall be accessible. Install above the ceiling immediately above the water riser, or within a chase wall behind an access panel.

E. VALVES: Provide shutoff valve in branch line to each piece of water consuming equipment or fixture. Stop valves serving plumbing fixtures do not require additional valve unless shown on the Drawings.

F. SLEEVES: Where water piping is shown below slabs to serve island sinks, etc. shall be encased in DWV PVC sleeve with solvent joints. Sleeve shall extend above slab.

END OF SECTION

SECTION 22 13 00 BUILDING SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 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 not interfere with access panels and maintenance space.

B. Piping shall be concealed in walls, chases and above ceilings except in mechanical equipment areas.

C. Cleanouts shall be installed above the flood rim of water closets and urinals, and above the top of the drain connection of sinks, lavatories and drinking fountains.

PART 2 - MATERIALS

2.1 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. Do not use sanitary tees. Do not use any fittings prohibited by the codes. Cast iron pipe shall be manufactured by Charlotte or Tyler Pipe. All piping shall comply with ASTM D1785/D2665.

B. MATERIALS:

01 ABOVE SLAB: Standard weight, centrifugally cast, bell and spigot cast iron, standard weight fittings per ASTM A-74, with Ty-seal joints. No hub piping with no hub clamps may be used if proper pipe supports are installed to maintain uniform slope and rigidity. Heavy weight, medium duty no-hub clamps shall be installed on all sanitary piping, excluding vents. Piping above inaccessible ceilings shall be bell and spigot cast iron.

02 BELOW SLAB: Schedule 40, DWV PVC

03 BELOW GRADE, BEYOND FIVE FEET FROM BUILDING: Schedule 40, DWV PVC. Pipe sizes over 6" may be heavy wall SDR-26 PVC sewer pipe meeting ASTM D3034 requirements.

C. HUB AND SPIGOT GASKETS: Hub and spigot gaskets shall be Tyler Ty-Seal, positive double seal compression type conforming to ASTM C564.

D. NO-HUB CLAMPS:

01 No-hub joints for sanitary lines shall be made with gasket and one-piece stainless steel, heavy weight, medium duty no-hub clamps (4 bands). No-hub clamps for pipes 6” and larger PIPE shall have 6 bands. Clamps shall be Husky HD 2000 or equal by Mission or Mi-Fab.

02 Gaskets for joints between PVC pipe and cast iron pipe shall be ASTM C-1540 listed, no-hub style couplings specifically designed for this application. Provide 4 band for sizes through 4” and 6 band for larger pipe. Bands at floor transition shall be within 1” of floor but not in the concrete. Husky SD4000 CI/PVC or equal.

03 Similar two band clamps may be used on vent piping.

E. CLEANOUTS: Install at each change of direction and at locations indicated on drawings. Exact location shall be reviewed by Architect prior to setting. Cleanouts 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. Where possible, cleanouts for serving plumbing fixtures shall be located above the flood rim of the fixture so that effluent does not spill out.

F. DRAINS: Floor drains installed in floors with waterproofing membranes shall 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. SYSTEM CLEANING: Hydro flush or rod out all sections of sanitary waste lines prior to substantial completion.

2.2 FLOOR DRAINS

A. GENERAL: All drains shall be trap primed, as indicated in the project documents. In addition to trap primers, provide Proset Systems Trap Guard sewer gas emissions protection device as indicated on the drawings.

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, security screws. Provide 1/2" trap primer tap, and/or Proset Systems Trap Guard sewer gas emissions protection where scheduled on the drawings.

C. EQUIPMENT 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. Provide 1/2" trap primer tap, and/or Proset Systems Trap Guard sewer gas emissions protection where scheduled on the drawings.

D. GRATED EQUIPMENT DRAINS: Cast iron floor drain with flange, seepage openings, 9” heavy duty ductile iron grate with stainless steel veneer. Provide 1/2" trap primer tap, and/or Proset Systems Trap Guard sewer gas emissions protection where scheduled on the drawings.

E. KITCHEN: Cast iron two-piece floor drain with seepage flange, reversible clamping collar, trap primer connection, 7" stainless steel strainer with tractor grate, riser and 1/2“

trap primer tap and Proset Systems Trap Guard sewer gas emissions protection. 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. All floor sinks shall have integral flange with seepage openings for support, clamping device and 1/2“ trap primer tap. Provide Proset Systems Trap Guard sewer gas emissions protection where scheduled on the drawings.

G. ACCEPTABLE MANUFACTURERS: Jay R. Smith, Mi-Fab, Wade or Zurn

2.3 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.

B. MATERIALS:

01 GENERAL: Cleanouts using gasketed cover to seal are not acceptable. All cleanout fittings shall have an internal pipe plug with tapered threads and additional cover for protection and finish.

02 UNFINISHED AREAS AND CHASES: Cast iron caulking ferrule with countersunk head with PVC plug.

03 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.

04 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.

05 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.

C. ACCEPTABLE MANUFACTURERS: Jay R. Smith, Mi-Fab, Wade or Zurn

2.4 GREASE TRAP AND SAMPLE WELLS

A. Provide as shown on the Drawings, complete with all piping, manhole covers, rims for covers, grates, rim for grates and concrete work.

END OF SECTION

SECTION 22 14 00 BUILDING STORM PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 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 not interfere with access panels and maintenance space.

B. Piping shall be concealed in walls, chases and above ceilings except in mechanical equipment areas.

PART 2 - MATERIALS

2.1 STORM DRAINAGE, INSIDE BUILDING

A. GENERAL: Provide roof drains, flashings and piping extending from drains to five feet outside of building. Cast iron pipe shall be manufactured by Charlotte or Tyler Pipe. All piping shall comply with ASTM D1785/D2665.

B. MATERIALS:

01 ABOVE SLAB: Standard weight, bell and spigot cast iron, per ASTM A-74, with Ty-Seal joints. No hub piping with heavy weight, medium duty no-hub clamps may be used on piping 8” and smaller if proper pipe supports are installed to maintain uniform slope and rigidity. Piping above inaccessible ceilings shall be bell and spigot cast iron.

02 BELOW SLAB: Schedule 40 PVC. For 24” pipe use ASTM F679 gasketed SDR26 PVC pipe. Minimize joints under the slab.

C. GASKETS: Hub and spigot gaskets shall be Tyler Ty-Seal, positive double seal compression type conforming to ASTM C564. No-hub joints shall be made with gasket and one piece stainless steel, heavy weight, medium duty no-hub clamps. Clamps shall be Mi-Fab Heavy Duty, Husky SD 2000, Clamp All Hi-Torque 80 or equal by Mission. No-hub clamps for pipes 6” and larger shall have 6 bands. Gaskets for joints between PVC pipe and cast iron pipe shall be Husky SD4000 CI/PVC specifically designed for this application. Provide 4 band for sizes through 4” and 6 band for larger pipe. Bands at floor

transition shall be within 1” of floor but not in the concrete

D. 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.

E. FINAL CLEANING: Hydroflush or rod out all sections of storm drain lines prior to substantial completion.

F. Refer to Architectural Drawings and Specifications for extension of drains.

2.2 STORM DRAINAGE, OUTSIDE BUILDING

A. GENERAL: Refer to Civil Engineering Drawings for location of storm inlets or junction boxes. Plumbing subcontractor shall extend building storm piping to the storm inlets that are provided by site subcontractor and make connection to inlet or junction box.

B. MATERIALS: SDR-26 PVC pipe in sizes through 12", and Schedule 40 PVC or standard weight cast iron with Ty-Seal joints for larger sizes. Cast iron pipe shall be manufactured by Charlotte or Tyler Pipe. 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. FINAL CLEANING: Hydroflush or rod out all sections of storm drain lines prior to substantial completion.

2.3 ROOF DRAINS

A. STANDARD ROOF DRAINS: Zurn Z-100-DP-DR Series or equal, 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. 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.

B. ACCESSORIES:

01 Series 1015 adjustable extension collar for insulated roof (where required)

02 Bearing pan and underdeck clamp

03 Vandal-proof, galvanized cast iron dome

C. ACCEPTABLE MANUFACTURERS: Jay R Smith, Mi-Fab, Wade and Zurn

END OF SECTION

SECTION 22 16 00 BUILDING NATURAL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 GENERAL REQUIREMENTS

A. Piping shall be installed in a neat and orderly manner parallel to building coordinates with vertical drops.

B. Piping shall be concealed in wall, chases and above ceilings except in the vicinity of equipment. All materials shall conform to the City Building Code.

C. Piping shall be sloped to prevent pockets. Slope toward equipment and provide dirt leg.

D. 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.

E. Piping shown underground shall be buried a minimum of 30 inches to top of pipe. 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.

F. All piping, fittings and valves shall be manufactured in the United States of America by National Tube, Republic and Youngstown.

PART 2 - MATERIALS AND METHODS

2.1 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:

01 ABOVE GROUND: Schedule 40 black steel, ASTM ERW A-53, Grade B or ASTM A106, with malleable iron screw type fittings. Welded joints may be used for piping 2½" and larger. Short radius elbows are not allowed.

02 BELOW GRADE: Polyethylene gas piping with socket weld connection, conforming to ASTM D2513, installed per manufacturer's requirements. Install minimum #14 copper wire in trench with pipe for locating purposes. Install X-Truecoat type schedule 40 steel pipe for the last five feet before exiting ground. Install dielectric union after piping exits the ground.

C. TEST TEES: Provide test tee in pipe at meter and on both sides of pressure reducing stations.

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 exposed gas piping shall be painted with two coats of industrial grade, yellow epoxy paint.

F. ACCEPTABLE PIPE MANUFACTURERS: National Tube, Republic and Youngstown

2.2 NATURAL GAS, INSIDE BUILDING

2.3 GENERAL:

A. 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 may be welded or screwed, except that piping in inaccessible locations and all piping 2½" and larger shall be welded. 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 unless specifically shown on the Drawings.

D. INSTALLATION:

01 Do not install any gas piping in unventilated spaces including inside walls, unless totally encased with airtight sleeving. Sleeving shall be all metallic construction, welded or screwed black steel, Schedule 10 or heavier. Sleeves shall be vented as shown on the Drawings.

02 Provide an all brass lever handle gas cock in an accessible location branch line at each individual piece of gas consuming equipment.

03 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.

04 All welded connections shall be made with bevel-ended pipe by certified welders.

05 All branch connections shall be made off the top of the main line.

E. PAINTING: All gas piping shall be painted with two coats of industrial grade, yellow epoxy paint.

F. ACCEPTABLE PIPE MANUFACTURERS: National Tube, Republic and Youngstown

2.4 GAS PRESSURE REGULATORS:

A. Size for full connected load, with stop valves on both inlet and outlet connections.

B. Select orifices for inlet pressures established by the gas company serving the building, and for outlet pressures as required to serve the proper pressure at the items of equipment being supplied.

C. Outlet pressure shall be field adjustable.

D. Capacities as indicated in Schedule plus 10%.

E. Gas regulator shall be ANSI Z21.80 certified for line pressure regulation between the service regulator and connected equipment.

F. All gas regulators with inlet pressure above 2 psi shall be equipped with a factory installed overpressure protection device, as part of the ANSI Z21.80 certification.

G. Gas regulator shall be equipped with a vent limiting device, sized in accordance with the regulator outlet pressure.

H. All regulators installed outdoors shall be rated for outdoor installation.

I. Basis of design is the Maxitrol 325-L series of regulators

J. ACCEPTABLE MANUFACTURERS: Maxitrol, Pietro Fiorentini, or pre-approved equal.

END OF SECTION

SECTION 22 34 00 FUEL FIRED DOMESTIC WATER HEATER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 GENERAL REQUIREMENTS

A. Provide all equipment, accessories and specialties indicated on the Contract Drawings, as specified, and as required under Section General Plumbing.

1.3 PRESSURE AND TEMPERATURE RELIEF VALVES:

A. GENERAL: Provide ASME rated, AGA certified and CGA listed for each water heater.

B. REQUIREMENTS: Select valve with the AGA-CGA rating equal to or greater than the input of the heater. Heaters with ASME constructed and labeled vessels, may use the ASME rating equal to or greater than the input to the heater, 1" minimum size. Valves shall be automatic re-seating type similar to Watts 40XL with test lever and extension bulb thermostat.

C. ACCEPTABLE MANUFACTURERS: Cash, McDonnell-Miller and Watts

1.4 CO MONITOR

A. GENERAL: Provide a CO monitor for each room where gas fired water heaters are installed.

B. REQUIREMENTS: Monitor shall comply with NFPA requirements and disable heaters within the same room and provide audible alarm. Interconnect sensor to each heater and provide expanders as necessary.

C. MANUFACTURER: US Draft Co Model CGM-505, or equal.

PART 2 - EQUIPMENT

2.1 COMMERCIAL GAS TANK WATER HEATER – LOW NOX

A. GENERAL: This specification refers to heaters 200 gallons or less and 199MBH or less.

B. DESCRIPTION: Glass lined tank, 2" fiberglass tank insulation with enameled steel

jacket, three-year commercial warranty (tank and parts), magnesium anode rods, ASME labeled T & P relief valve pipe to drain, vacuum breaker on inlet, adjustable controller and high limit safeties.

C. COMBUSTION: Fan assisted burner, low NOx certified for emissions of 14 ng/J or 20 ppm or less.

D. GAS UNITS: Shall be AGA certified, complete with pilot safety shutoff and draft diverter.

E. CERTIFICATIONS: Design certified by the Underwriters Laboratory under Volume Ill tests for commercial heaters for delivery of 180°F water and meets the thermal efficiency and standby loss requirements of the U.S. Department of Energy and Current Edition of ASHRAE/IES 90.1.

F. WARRANTY: Heaters shall have three-year commercial warranty against corrosion or sediment buildup. The entire heater shall be covered for 1-year as part of the contractors guarantee.

G. ACCEPTABLE MANUFACTURER: A. O. Smith, Bradford White, Lochinvar or State

END OF SECTION

SECTION 22 42 00 COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 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.

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.

F. P-traps shall be chrome plated, cast brass body, adjustable type with bottom cleanout plug and 17 gauge tubing outlet with wall flange.

G. Provide 1/2" x 3/8" angle valve, loose key, supply stops with flexible supply risers for fixtures. Provide Marvel mechanical coupling for connection to copper piping.

H. 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. Prowrap by McGuire or Trap Wrap by Brocar Products, Inc., will also be acceptable. Controls for flush valves shall be mounted on the wide side of toilet areas as required by the handicap codes.

I. Install Symmons 7-210-CK mixing valve on HW supply side of all lavatories and sinks, including fixtures not provided by Plumbing Contractor (i.e. lab sinks, kitchen faucets, etc.). Refer to Plumbing Drawings.

1.3 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.

1.4 ACCEPTABLE MANUFACTURERS

A. WATER CLOSETS, LAVATORIES AND URINALS: American Standard, Sloan, Kohler or Toto

B. SINKS AND SERVICE SINKS: Elkay or Just

C. MOP BASINS: Fiat or Sterns Williams

D. BOTTLE FILLER / DRINKING FOUNTAINS: Elkay LZSTL8WSBPRO, or equal by OASIS with owner approval.

E. TOILET SEATS: Bemis 1655-C/SS with stainless steel, self-sustaining check hinge or equal by Church

F. FAUCETS: Chicago or Zurn (Zurn shall have 5 year warranty)

G. METERING FAUCETS: Chicago, Symmons

H. ELECTRONIC FAUCETS: N/A

I. MANUAL FLUSH VALVES: Sloan Royal or Zurn Aquavantage XL

J. FIXTURE STOPS, P-TRAPS AND RISERS: McGuire or Zurn

K. CARRIERS: Wade, Mi-Fab Jay R Smith (Not JRS) or Zurn

L. WASH FOUNTAINS: Acorn or Bradley

M. INDIVIDUAL SHOWER VALVES: Bradley Equaflo-HD, Symmons Safetymix or Leonard PAM II

N. WALL HYDRANTS: Jay R Smith, Mi-Fab, Wade or Zurn

PART 2 - MATERIALS AND METHODS

2.1 FIXTURE SUPPORTS

A. GENERAL:

01 Provide fixture supports for all water closets, lavatories, urinals, drinking fountains and other wall hung fixtures.

02 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.

03 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:

01 WATER CLOSET CARRIER: adjustable, water closet carrier with lacquered cast iron fitting, 4” no hub waste, 2” no hub vent connection, lacquered cast iron gasketed adjustable faceplate, universal floor mounted cast iron foot supports, adjustable 8” tapered thread ABS nipple with integral test cap, neoprene bowl gasket, hardware, threaded rod protectors, polished chrome plated finishing cap nuts and rear anchor tie down support. Provide 2” auxiliary inlet where required by project documents. Provide auxiliary support for threaded nipple were overall length exceeds 12” or maximum recommended by the manufacturer. Carrier shall be rated for a load of 750lb. Provide flush valve support with all carriers.

02 LAVATORY CARRIER: Floor mounted concealed arm lavatory carrier with lacquered, adjustable, ductile iron concealed support arms, lacquered cast iron invertible and adjustable arm supporting brackets, adjustable steel nipples with locknut and set screws, alignment rod, two lacquered 2” x 1” x 1/8” thick structural steel uprights with 3” x 4 ½” welded steel feet and fixture leveling and locking hardware..

03 URINAL CARRIER: Double plate carrier with universal, adjustable, top support plate and bottom bearing plate, lacquered 2” x 1” x 1/8” thick structural steel uprights with 3” x 24″ welded steel feet and mounting hardware.

04 ELECTRIC DRINKING FOUNTAIN AND BUBBLER CARRIERS: Double plate carrier with universal, adjustable, top support plate and bottom bearing plate, lacquered 2” x 1” x 1/8” thick structural steel uprights with 3” x 24″ welded steel feet and mounting hardware.

05 EYEWASH: Double plate carrier with universal, adjustable, top support plate and bottom bearing plate, lacquered 2” x 1” x 1/8” thick structural steel uprights with 3” x 24″ welded steel feet and mounting hardware.

06 SERVICE SINK: Double plate carrier with universal, adjustable, top support plate and bottom bearing plate, lacquered 2” x 1” x 1/8” thick structural steel uprights with 3” x 24″ welded steel feet and mounting hardware.

07 ACCEPTABLE MANUFACTURERS: Jay R Smith, Mi-Fab, Wade, Zurn

2.2 PLASTER TRAPS

A. Provide Mi-Fab MI-SOLID-SA-6 Series stainless stee solids interceptor for sinks scheduled to have a plaster trap. Install to allow removal of bucket and to meet all ADA/TAS clearance requirements. Equal by Wade, JR Smith or Zurn is acceptable.

2.3 FIXTURES

A. See Drawings.

END OF SECTION

SECTION 22 47 00 DRINKING FOUNTAINS AND COOLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 22, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 22 00 00.

1.2 GENERAL REQUIREMENTS

A. Provide all fixtures 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.

C. 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.

D. Fixtures and equipment shall be delivered to the building properly crated and in perfect condition.

E. In addition to the manufacturers listed, equipment of identical design, quality and appearance will be considered when of the following manufacture:

01 DRINKING FOUNTAINS: Elkay, Oasis (with owner prior-approval)

PART 2 - MATERIALS AND METHODS

2.1 EQUIPMENT

A. See Drawings.

END OF SECTION

SECTION 23 00 00 GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.2 INTENT OF DRAWINGS AND SPECIFICATIONS

A. GENERAL: Drawings and Specifications are intended to be complimentary. Any work described in either of these documents shall be required under this contract. Where there is a conflict between the Drawings and Specifications, a Request For Information (RFI) shall be submitted to clarify the design intent. Barring clarification prior to bidding, the most expensive option shall be included. Clarification shall be made during construction. Should any work required by the drawings and specifications be in violation of any Federal, State, City or County laws, ordinances or regulations, 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. DRAWINGS: The drawings are schematic in nature. They are intended to 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 component locations through coordination with the Owner's Representative, job site measurements, the requirements of the other trades, and all contract documents. The Drawings indicate general routing of the various parts of the systems, but do not indicate all fittings and offsets that may be required to fit the system into spaces allotted for them. The Contract shall include these items as required for a complete installation.

C. BASIS OF DESIGN: Scheduled equipment is the basis of design (BOD) and has been coordinated for space, installation, and electrical requirements. Equipment and models from other acceptable manufacturers have not been verified or coordinated. Contractors who use other equipment in their bid shall verify space, installation, and electrical requirements prior to bidding and include any additional costs for the installation of the substituted equipment.

1.3 MATERIALS

A. GENERAL: Manufacturer's printed directions shall be followed for preparing, assembling, installing, erecting and cleaning manufactured materials or equipment, unless otherwise directed. 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. SUBSTITUTION: 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.

C. SUBSTITUTION REQUIREMENTS: 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 drawing to scale showing how the equipment and required access space will fit the available space. Acceptance for bidding does not waive the post bidding requirement for formal submittal and approval.

1.4 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 other sections. The locations of all inserts and openings shall be determined under this Section and coordinated with the other Sections in ample time to avoid cutting new construction.

D. EQUIPMENT AND PIPING SUPPORT REQUIREMENTS: 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.

1.5 ALTERNATES

A. GENERAL: 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.

1.6 PERMIT, FEES AND APPROVALS

A. The contractor shall obtain and pay for all permits and fees to perform his work. He shall 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 from the various insuring and inspection authorities shall also be obtained. Refer to Architectural sections for additional information.

1.7 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 additional compensation shall be allowed for failure to fully understand the requirements.

1.8 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.

1.9 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.

1.10 INSTALLATION REQUIREMENTS

A. COORDINATION: 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 to coordinate his work with the total project.

B. WORKMANSHIP: 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.

C. CLEAN-UP: Keep area of operations free from accumulation of waste material or rubbish at all times. All piping above accessible ceilings shall be cleaned of cement, plaster and other construction debris prior to being concealed. The parts of the Mechanical installation which are to be painted or insulated shall be thoroughly cleaned of cement, plaster, grease, oil spots and other materials in preparation for painting or insulating.

D. EQUIPMENT PROTECTION: Do not deliver equipment to jobsite until it is actually needed for installation. Protect equipment from damage due to construction activities and the weather. Equipment allowed to stand in weather will be rejected and Contractor is obligated to furnish new equipment at no cost to Owner.

E. CUTTING AND PATCHING: 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. Where concrete flooring or paving must be cut to install MEP systems, contractor shall take measures to prevent damaging existing underground services. Contractor shall x-ray the area to be saw cut to determine the existence of underground services. When saw cutting, limit the depth of the cut to less than the thickness of the concrete. Breakout the concrete manually with special care in areas of possible underground services.

F. STRUCTURAL STEEL: All structural steel used for the purpose of fabricating equipment supports, pipe supports, pipe guides, pipe anchors 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.

G. CONCRETE PADS: All equipment mounted on the floor, including expansion tanks and pot feeder, shall have a concrete housekeeping 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.

H. ROOF MOUNTED EQUIPMENT SUPPORTS: For equipment mounted on the roof, provide curbs for air handling units, RTU’s, ERV’s, fans and similar equipment. Provide roof curbs and housing for duct and pipe penetrations of the roof. Provide Thycurb structural support rails for roof mounted condensing units, chillers, and similar equipment without large roof penetrations. Select rails for equipment size, weight and to span at least two roof joists per rail.

I. WIND RATING FOR ROOF EQUIPMENT: Equipment curb and equipment anchoring brackets shall be designed to withstand an ASCE 7-22 Wind Hazard Rating of 147 mph, for a Category III building at the project address. The curb provider shall include stamped drawings of the curb and anchoring demonstrating compliance.

J.

1.11 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 – TEST AND BALANCE**.

B. After completion of the work and before final acceptance thereof, the Contractor shall notify the Architect when he has balanced the air and hydronic systems to within ±10% of the scheduled values. Provide test report as described in Section 23 05 93.

1.12 SHOP DRAWINGS

A. All submittals shall be submitted in PDF form. Submittal will be reviewed with comments incorporated in this PDF. After final approval, Contractor shall provide a hard copy for use at the project site.

B. The purpose of these submittals is to attempt to aid the contractor in such a manner that improper or unacceptable material is not delivered to or installed on the job. Shop drawings shall be approved before installation of the material under consideration. 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.

C. 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. Ductwork shop drawings shall include one printed set of drawings in addition to the PDF. 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:

   01 Job name and location.

   02 General Contractor's name, address, project manager's name and telephone number.

   03 Submitting Sub-contractor's name, address, project manager's name and telephone number.

   04 Suppliers company name, address, salesman's name and telephone number.

D. 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.

E. Shop Drawings are required for but are not limited to the following items:

   01 Chillers

   02 Air Handling Units

   03 Heating Boilers

04 Energy Recovery Units
05 DX Split Systems and Unit Controller
06 Particulate Air Filtration
07 HVAC Pumps
08 Fans & Roof Curbs
09 Packaged DX Rooftop Units
10 VAV/CVT Boxes
11 HVAC Ductwork & Casing
12 Fabric Duct Sock
13 Duct Accessories
14 HVAC Insulation
15 Air Devices
16 Sound Attenuators
17 HVAC Controls and Sequence of Operation
18 Refrigerant Piping
19 Hydronic Piping
20 Hydronic Specialties
21 Fire & Smoke Dampers
22 Motor Starters
23 Vibration Isolation
24 Piping Materials
25 DX Condensing Units
26 Sound Attenuators
27 Electric Duct Heaters
28 Pipe Markers
29 Roof Pipe Supports
30 Chilled Water Storage Tank
31 Gas Unit Heaters
32 Electric Unit Heaters
33 Condensers
34 Water Treatment
35 Ductwork Shop Drawings
36 1/4” Scale Mechanical Room Drawings

F. 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.

G. Major equipment in AHU/Mechanical Rooms will not be approved until contractor has submitted and received approved 1/4" scale coordination drawings of mechanical and air handling unit rooms showing sizes of proposed equipment, including access space, and plumbing and electrical equipment also located in the room.

H. 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. SEG 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 SEG at a rate of $125/hr for these occurrences.

1.13 SUBSTITUTIONS

A. The manufacturer names and model numbers have been used in the Contract Documents to establish types of equipment and standards of quality and are intended to be the Basis of Bid. 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 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 and this Article. If a submittal contains sufficient information to prove compliance with the Contract Documents, then that submittal will be acceptable.

B. All other brands, including any additional names which may be listed as "Alternates" or "Approved Equal" must conform with the specifications, size, accessories, etc. of the first named brand and be subject to Paragraph D and E of this Article. Alternate equipment 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 Paragraph D and E of this Article.

01 Submitted on Bidder's letterhead attached to Proposal Form with individual deductive amounts stipulated and the documentation required in Paragraph E-03.

02 All savings for Owner's selection of deductive amounts by acceptance of alternate or substituted items are to be paid to the Owner.

C. All equipment within common group or category (e.g., switchgear, lighting fixtures, fire alarm, etc.) shall be same manufacturer.

D. Proposed Substitutions/Approved Equals:

01 Submitted no less than 14 calendar days prior to bid date.

02 Submit proposed substitutions with catalog data and/or manufacturer's shop details indicating all modifications required to conform with specified brand. Include all relevant items necessary to determine equal status or submittal shall be deemed incomplete and rejected.

03 If submittal contains sufficient information to prove compliance with the Contract Documents, then that alternate submittal will be acceptable. Approved submittals for bidding purposes only will be published by addenda.

E. Substitutions without prior approval/post bid:

01 Submitted on Bidder's letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in

Paragraph B-2.

02 Owner reserves the right to accept or reject any or all substitution proposals before execution of Contract.

03 Provide all design/engineering services required to adjust in space, systems, utilities, etc. and pay all additional costs of utilities, construction or professional services that may be incurred due to the acceptance of any substitution.

1.14 MECHANICAL INSPECTIONS

A. GENERAL: Contractor shall formally request inspections of any and all mechanical systems installations. Inspections shall include but not be limited to duct pressure tests, pipe tests, underground installations prior to backfill, rough-in installations, wall cover inspections, above ceiling inspections and final inspection.

B. Contractor shall provide a MINIMUM of 48-hour notice prior to requested inspection time, no exceptions.

C. INSPECTION REPORTS: After each inspection, SEG 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 frame. 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 SEG via e-mail. After the signed-off report is returned to SEG, the GENERAL CONTRACTOR shall request a re-inspection by SEG to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, SEG reserves the right to re-inspect whenever our schedule allows, with these re-inspections still being subject to Paragraph E below.

D. TEST REJECTIONS AND RE-INSPECTIONS: If a test is rejected or a re-inspection of an issued SEG 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. SEG shall be reimbursed $500 by the GENERAL CONTRACTOR for expenses in connection with EACH inspection in addition to the two (2) inspections allowed.

1.15 COMMISSIONING AND TEST AND BALANCE

A. Third party commissioning and an independent test and balance contractor are a part of this project. Commissioning agent and T&B contractor will be under a separate contract directly with Owner. Refer to included specifications for commissioning and T&B.

B. Mechanical contractor shall complete the pre-function checklist for the various mechanical devices. Checklists will be supplied by the commissioning agent.

C. Mechanical contractor shall perform system tests as required by the commissioning agent in addition to any that are described in these specifications.

END OF SECTION

SECTION 23 00 10 MECHANICAL SYSTEMS CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 23, apply to the work specified in this Section.

PART 2 - MATERIALS AND METHODS

2.1 CLOSEOUT REQUIREMENTS

A. ENERGY MANAGEMENT SYSTEM: 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 shall maintain all of the space temperatures at plus or minus two degrees of set point.

B. AS-BUILT DRAWINGS: 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.

C. CLOSEOUT MANUALS: 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. Bind in 3-ring binders with project name.

D. CLOSEOUT DOCUMENTS: Provide three printed copies of the approved submittal with wiring diagrams, sequences, floor plans and graphics updated to the final installation configuration.

E. REFRIGERANT: Furnish and install full refrigerant and oil charge in the air conditioning refrigeration systems and maintain it for full term of the guarantee.

F. LUBRICATION: After the installation is completed, lubricate all moving parts of all equipment furnished under this Division of the Specifications. 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.

2.2 GUARANTEES AND WARRANTIES

A. GENERAL FOR MECHANICAL SYSTEMS: 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.

B. TEMPERATURE CONTROLS: 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.

C. AIR COOLED CHILLERS: Provide a one-year warranty (parts and labor) for total unit. Provide a four-year extended warranty (second through fifth year) on the motor-compressor-drive assembly for parts and labor, including refrigerant. All replacement parts shall be newly manufactured. For each chiller provide factory certificates listing chiller model, serial number and warranty information in the close out documents.

D. ENERGY RECOVERY UNITS: Two years on the unit and ten years on the core.

E. ROOFTOP UNITS: One year on the unit and five years on the compressors.

F. AIR COOLED CONDENSING UNITS: Provide five-year compressor warranty.

G. PUMPS: One year on the unit.

H. AIR HANDLERS: One year on the unit.

I. BOILERS: One year on the unit.

J. WARRANTY STATEMENT: One year on the unit.

2.3 SPARE PARTS

A. GENERAL: 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.

B. FILTERS: Install a complete set of filters for all equipment at substantial completion.

2.4 TRAINING

A. GENERAL: Provide eight hours of instruction to the Owner's designated personnel upon completion of the building mechanical system's installation. Provide additional training for specific systems as noted in the following sections.

B. TEMPERATURE CONTROLS SYSTEM: Provide 8 hours of instructions on system operation to Owner's personnel during the closeout period of the project. Additionally, the contractor shall supply the Owner with a training DVD that will instruct the Owner’s personnel on recommended, detailed, maintenance procedures and troubleshooting of their equipment. Provide an additional 48 hours of instructions over a 3-year period for but not limited to operate interface program, software programming, system diagnostics, hardware installation and repair. No session to be more than 4 hours long with no limit on attendees. Technical support for 3 years over the phone shall be provided at no additional cost to the Owner. The Contractor shall be able to call and diagnose the system from his office.

END OF SECTION

SECTION 23 05 00 COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 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.

B. Where concrete flooring or paving must be cut to install MEP systems, contractor shall take measures to prevent damaging existing underground services. Contractor shall utilize ground penetrating radar and electrical circuit tracing equipment in the area to be saw cut to determine the existence of underground services. When saw cutting, limit the depth of the cut to less than the thickness of the concrete. Breakout the concrete manually with special care in areas of possible underground services.

2.2 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 copper piping shall have a minimum on one intermediate support if over five feet.

B. HORIZONTAL PIPING SUPPORT SPACING: As recommended by support manufacturer, but spaced not more than listed below:

01	Pipe Size	Steel Pipe	Other Pipe

02	1" & Smaller	6 Feet	4 Feet
03	1¼" & 1½"	8 Feet	5 Feet
04	2"	8 Feet	5 Feet
05	2½" to 4"	8 Feet	6 Feet
06	6" and Larger	8 Feet	6 Feet

C. 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. Hangers shall be manufactured by Grinnell or Tolco. Do not use perforated strap.

01 SINGLE RUNS OF PIPE, NO EXPANSION PROBLEM: Adjustable clevis type Grinnell Figure 260.

02 MULTIPLE RUNS: Trapeze hangers.

03 BEAM CLAMPS: Grinnell Figure 92 for smaller pipe

04 BEAM CLAMPS: Grinnell Figure 228 (storm or sanitary 8" and larger)

D. 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.

E. SUPPORT MATERIAL FINISH: Galvanized or cadmium plated steel. Provide hot dipped copper clad supports for copper piping.

F. 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.

2.3 MOTORS

A. GENERAL: This section applies to motors larger than 1/2 horsepower and not part of an assembly. 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 be designed for this application.

B. ENCLOSURE: Drip proof for locations protected from the weather; totally enclosed fan cooled for exposure to weather or installed inside air handling units or serving pumps. 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.

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. Provide sleeve bearings with oil cups for units requiring minimum noise level. Average bearing life shall be 150,000 hours.

I. ACCEPTABLE MANUFACTURERS: Allis Chalmers, Baldor, Century, General Electric, Marathon, Reliance, Siemens, US Motors and Westinghouse.

2.4 VALVE INSTALLATION

A. Ball and butterfly 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. All valves above a ceiling shall be installed within 24” of the ceiling.

2.5 VALVE IDENTIFICATION

A. GENERAL: Each valve 2” and larger, except those located adjacent to the equipment they serve, shall have a tag of .050-inch-thick by 1½" diameter brass, stamped or engraved with the valve number and service symbol. Attach tag to the valve with stainless steel chain.

B. SCHEDULE: 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. Mark the symbol and number of all valves, exactly as the valves are tagged on the "As Built" Drawings. Provide one valve schedule, as above, installed in aluminum frame with plastic shield, and mount on wall of main equipment room.

C. CEILING IDENTIFICATION: For valves above accessible ceilings, glue red star on ceiling tee intersection nearest the valve location.

2.6 EQUIPMENT IDENTIFICATION

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. Provide lamacoid nameplate with minimum 1.5 inch letters.

B. The following equipment may be marked with decal or stencil painted, 3" high letters:

01 Air Handling Units

02 Rooftop Units

03 Condensing Units

04 Chillers

05 Boilers

C. The following equipment may be marked with decal or stencil painted, 2" high letters:

01 Fans

02 VAV/CVT Boxes

03 Pumps

2.7 PIPE IDENTIFICATION

A. Identify all new and existing system piping. Use EMED Co. Kwik-Koil Pipe Markers of appropriate legend and background color, complete with direction arrow. Select appropriate size for diameter of the piping including insulation. Markers or arrows not wrapping the full circumference of the pipe shall be tie wrapped in place, otherwise taped at each end.

B. Apply markers as follows:

01 At input and output of each piece of equipment inside building.

02 At each valve not in a mechanical room.

03 At every point a pipe enters or exits a wall or floor.

04 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:

01 Chilled Water Supply

02 Chilled Water Return

03 Heating Water Supply

04 Heating Water Return

2.8 PIPE 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)

01 Chilled Water Medium Blue

02 Heating Water Maroon

2.9 ACCESS PANELS

A. REQUIRED: Panels of size and location to provide access to all concealed valves and equipment. Obtain Architect's approval of locations and type before ordering.

B. SIZE: Minimum 12" x 12", larger where required for adequate service access.

C. WALL MOUNTED: Best suited for surface materials in which installed, constructed of 12 gauge stainless steel, complete with anchor straps, concealed hinges, dust tight door and cylinder lock, all doors keyed alike. Prime coated steel is acceptable for installation in painted surfaces. U. L. Listed for 1-1/2 hour rating.

D. DUCT MOUNTED: Galvanized steel construction with four cam latches. Provide 1"

fiberglass insulation for insulated ducts. Minimum size of 16"x16" unless limited by duct size.

E. ACCEPTABLE MANUFACTURERS: Acudor, Mi-Fab and Zurn.

2.10 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.

B. Sleeves through floors and through fire walls shall be fire caulked or otherwise protected to maintain the fire rating of the wall.

2.11 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 3".

2.12 DIELECTRIC UNIONS

A. Provide dielectric insulating unions at all connections between dissimilar metals.

2.13 HEAT TRACE SYSTEM

A. GENERAL: Install freeze protection system on mechanical piping where noted on the Drawings or in these specifications.

B. MATERIALS: Raychem XL-Trace self-regulating heat tape, Catalog 5XL2-CR, 5 watts per foot, 208 volts. Provide power connection kit for plugging into a receptacle, end seal and thermostat.

C. INSTALLATION: Install straight along bare pipe wrapping around valves. Tie wrap to pipe at short intervals. Installation shall be in accordance with manufacturers recommendations.

2.14 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:

01 All vibration isolators shall be designed or treated for resistance to corrosion.

02 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 the minimum required. 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.

01 GENERAL: Provide an aluminum housed, adjustable, spring mounting having telescoping top and bottom sections separated by resilient inserts of neoprene or other suitable material to limit horizontal motion. The inserts shall be permanently lubricated to minimize vertical friction. Steel or cast iron housings may be used if they are cadmium plated or hot-dip galvanized after fabrication. A neoprene pad having a minimum thickness of 1/4" shall be bonded to the base plate. Amber Booth XLS, Style A.

02 FLOOR MOUNTED AT GRADE LEVEL:

a. 5 HP OR LESS: 1" deflection, 90% efficiency.
b. 7½ HP THRU 20 HP: 1½" deflection, 90% efficiency.

03 FLOOR MOUNTED ABOVE GRADE:

a. 5 HP OR LESS: 1½" deflection, 95% efficient.
b. 7½ HP THRU 30 HP: 2" deflection, 95% efficiency.

04 STRUCTURE SUPPORTED UNITS: Spring hanger, same as pipe hanger.

a. 5 HP OR LESS: 1½" deflection, 95% efficient.
b. 7½ HP THRU 20 HP: 2" deflection, 95% efficiency.

G. PUMPS: Mount floor mounted pumps on a 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. Amber Booth Type SS-FP.

I. CHILLERS: See Chiller Specification

J. FANS:

01 GENERAL: This Section refers to in-line fans and other structure hung fans including CVT BOXES. Non-fan powered boxes (VAV) do not require isolators.

02 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% efficient.

03 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.

K. ACCEPTABLE MANUFACTURERS: Amber/Booth, Kinetics, Korfund, Mason, Peabody, Vibra-Sonics, Vibration Mountings and Southeastern Hose.

2.15 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:

01 For non-drainage lines backfill with approved backfill material to 95% standard proctor, by hand compaction.

02 For drainage lines, the lower 12” shall be backfilled with cement-stabilized sand 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 1/2 the diameter of the 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.

03 Backfill for pipe in City Property must comply with City requirements.

D. SAFETY SYSTEMS: Refer to Architectural Sections for additional requirements.

END OF SECTION

SECTION 23 05 93 HVAC TEST AND BALANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

1.2 GENERAL REQUIREMENTS

A. Contractor shall complete the HVAC systems installation and ensure it is operating in the specified manner in a timely manner so the third party Testing and Balancing Contractor may complete his work prior to substantial completion.

B. Provide all instruments and equipment required to pre-balance the system. All instruments shall be in accurate calibration, and shall be calibrated in ranges that will be expected.

1.3 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	60% RH
Outdoor Temperatures	95° F DB	80° F WB

Winter Conditions

Indoor Temperatures	70° F DB
Outdoor Temperatures	20° F DB

PART 2 - MATERIALS AND METHODS

2.1 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 equipment for the Owner will be performed by an impartial, technical TAB firm selected and employed by the Owner as described in paragraph 2.3.

2.2 HVAC

A. BOILER INSTALLATION:

01 GENERAL: Before initial firing, the manufacturer's representative shall certify that the installation is safe for firing.

02 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.

03 BOILER LICENSE: Contractor shall provide completed boiler installation report and temporary boiler operating permit on forms downloaded from: http://www.license.state.tx.us/boilers/blrforms.htm.

B. HVAC CONTRACTOR'S SCOPE OF WORK

01 The contractor shall operate the systems for the length of time necessary to properly verify their completion including final adjustments, balancing and readiness for Owner's TAB firm.

02 The HVAC Contractor shall provide and coordinate services of qualified personnel and equipment suppliers as required to correct repair or replace all deficient items or conditions found during the testing, adjusting and balancing period.

03 The HVAC Contractor shall make any changes in the sheaves, belts, dampers, valves and pump impellers required by the TAB firm to balance the system, at no additional cost to the Owner.

04 Contract completion schedules shall provide sufficient time to permit the completion of TAB firm's services prior to Owner occupancy.

05 The Drawings and Specifications have indicated valves, dampers and miscellaneous adjusting devices for the purpose of adjustment to obtain optimum operating conditions. 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 immediately corrected by the contractor so the balancing work can proceed.

06 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

01 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.

02 For the air distribution systems the contractor shall complete and verify the following:

a. Verify installation for conformity to design.
b. All supply, return and exhaust ducts shall be completed. 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 units and ductwork shall be sealed to eliminate excessive by-bass or leakage of air.
e. All air handling units and fans shall be operating and verified for freedom from vibration, proper fan rotation and belt tension. Starter overload heater elements shall be properly sized, and clean filters installed.

03 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 and treated and all strainers cleaned for normal operation. Water circulating systems shall be full and free of air; all vents installed at high points of systems
c. Check each motor amperage and voltage to insure readings do not exceed nameplate rating.
d. Verify electrical overload heater elements to be of proper size and ratings.
e. Check and set operating temperatures of heat exchangers to design requirements.

04 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.
b. All controlling instruments calibrated and set for design conditions.

05 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.

06 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.

07 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.

08 The contractor shall assist the TAB firm in performing three inspections approximately 30 days apart within 90 days after occupancy of the building to insure that satisfactory conditions are being maintained throughout and to correct any unusual condition.

09 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

01 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

01 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.

02 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.

2.3 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. 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 the Owner.

D. 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.

E. 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.

F. QUALIFICATIONS OF THE FIRM

01 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.

02 The firm shall have a minimum of one year operation under its current firm name.

03 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.

G. DOCUMENTS

01 The Owner will provide plans, specifications and change orders to the TAB firm.

02 The Owner will provide approved submittal data on equipment installed.

03 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

H. RESPONSIBILITY OF THE TAB FIRM

01 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.

02 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.

03 The TAB firm will not instruct nor 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.

I. BALANCING SERVICES

01 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.

02 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.

03 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.

04 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 principle 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.

J. REPORT: After balancing is complete and before calling for final observation, record and submit for record, the following data:

01 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.

02 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.

03 Each 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.

04 Each Air to Air Energy Recovery Unit (ERV)

a. Outside air supply CFM
b. Outside air entering and leaving air temperature (dry bulb & wet bulb)
c. Exhaust air CFM
d. Exhaust entering air temperature (dry bulb & wet bulb)

05 Each VAV or CVT 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.

06 For each 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.

07 Each Boiler:

a. Safety inspection authority approval certificate.
b. Orsat flue gas analysis report.
c. Operating pressure and temperature.
d. Safety control setting points.

08 Each condensing unit:

a. Ambient air temperature and condenser discharge temperature.
b. Motor nameplate F.L.A., actual amps and voltage.
c. Suction and discharge pressures and temperatures.
d. Verification that moisture indicator shows dry refrigerant.
e. Settings of all operating and safety control.

09 Each Rooftop Unit:

a. Fan data as for fans above.
b. Entering and leaving air temperature for cooling and heating.
c. Suction and discharge pressures and temperatures.
d. Verification that dry eye sight glass shows full charge of dry refrigerant.
e. Settings of all operating and safety controls.

10 For 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 must contact the Mechanical Contractor. Mechanical Contractor will repair system as required. TAB firm will then test and balance the system as specified.

K. REPORT APPROVAL

01 After report is submitted and reviewed by Engineer, Test and Balance Contractor shall meet with the 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.

L. AFTER OWNER OCCUPANCY:

01 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. Architect for each trip. List in the letter corrections made.

02 At the season opposite that of startup, inspect and verify correct operation of all systems. Make adjustments as required.

END OF SECTION

SECTION 23 07 00 HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 GENERAL REQUIREMENTS

A. Install all insulation in conformance with manufacturer's recommendations and these specifications.

B. Insulation materials manufactured by the following list of companies will be acceptable provided their materials conform to these specifications: Armacell, CertainTeed, Knauf, Koolphen, Manville and Owens-Corning.

C. Flame Spread and Smoke Requirements:

01 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.

02 All materials containers shall have a U. L. Label.

D. At each pipe support point, provide 10” long, formed 16 gauge galvanized sheet metal saddle. For piping 1½” and larger, install a hard section of Koolphen K phenolic foam pipe insulation the same length as the pipe saddle. Seal and finish to match adjoining insulation.

E. 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. Cover is not required in mechanical or AHU rooms.

PART 2 - MATERIALS AND METHODS

2.1 CHILLED WATER PIPING

A. GENERAL: 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.

B. PIPE:

01 MATERIALS: Molded Koolphen K or Insulphen 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.

02 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:

01 MATERIALS: Pre-molded cover of same materials and thickness as pipe covering.

02 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: 2”

2.2 BUILDING HEATING WATER PIPING

A. GENERAL: Insulate all hot water piping with factory molded fiberglass pipe insulation with factory attached fire retardant jacket. Insulation shall be 3 pounds per cubic foot with conductivity (k) not higher than .25 at 100° mean temperature difference. Piping insulation outside shall be thicker.

B. THICKNESS: 1½” thick for pipes 1½” and smaller. 2” thick for larger pipes. Increase thickness by 1/2” if piping is outside.

C. INSTALLATION: Secure all laps and joints with staples at 4" on center. Provide 3" butt strips at each joint between sections.

D. FITTINGS: Insulate fittings with pre-molded cover of same materials and thickness as pipe covering.

2.3 CONDENSATE DRAINS

A. Insulate all condensate drain lines in same manner as specified for Heating Water Piping, except 1/2" thick. Exposed piping located close to the floor inside an equipment room, from an air handling unit to floor drain, need not be insulated.

2.4 LAP AND JOINT ATTACHMENT

A. Self-sealing type jackets will be acceptable provided the laps are sealed per the manufacturer's recommendations.

2.5 REFRIGERANT PIPING

A. GENERAL: Insulate all refrigerant suction piping.

B. MATERIAL: 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. Chemical composition of material shall not cause or accelerate corrosion or other deterioration of piping. Provide 1" thick insulation if pipe is 2½" or larger.

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 UV protective coating for insulation installed outside.

D. MANUFACTURER: K-Flex, Armacell (ADD #2)

2.6 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: Fiberglass board with minimum 6 pounds per cubic foot density or 2" thick foam glass.

C. INSTALLATION: Cut and form to fit or foam in place. Fill any voids with flexible glass fiber insulation. Seal all joints with 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. Apply tack coat white Foster 30-80AF vapor barrier coating and then a 1/16" thick finish coat of same material. This application shall provide a minimum dry film thickness of 37 mils

2.7 CHILLED WATER SYSTEM EXPANSION TANK, AIR SEPARATORS, STORAGE TANK AND FILTER FEEDER

A. Insulate with 1" thick Koolphen K phenolic foam, or Rubatex closed cell foam insulation with vapor barrier. Equal product by Armacell is acceptable.

2.8 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 air devices where ceiling above is not used as a return plenum.

B. DUCTS INSIDE: 2" thick, 1 pound density (Type 100) fiberglass flexible duct insulation, with a conductivity (k) value not more than 0.27 at 75° mean temperature difference for an installed R value of 6 or higher. Insulation shall have a 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. EXPOSED AREAS INSIDE: Add reinforcing mesh for exposed areas, tack coat with anti-fungal Foster 30-80AF vapor barrier coating, and finish with flood coat of 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. Reinforcing mesh shall be 10x10 Childers Chil Glas #10 or Foster Mast a Fab. Ductwork inside mechanical and air handling unit rooms is not considered exposed ductwork.

D. DUCTS THROUGH NON-FIREWALLS: Install reinforcing mesh on insulation for ducts passing through walls the same as for C. EXPOSED AREAS INSIDE. Mesh shall extend 6” beyond wall on either side of the wall.

2.9 KITCHEN HOOD EXHAUST DUCT

A. GENERAL: Insulate exhaust ducts serving kitchen hoods over ranges or other high heat producing equipment.

B. MATERIAL: Pyroscat FP Duct Wrap rated for 2300° F. 3M Fire Barrier Duct Wrap installed per manufacturer’s recommendations is also acceptable.

C. INSTALLATION: Insulate with two 2" layer. 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.

2.10 ACOUSTICAL DUCT LAGGING

A. GENERAL Provide and install acoustical duct wrap on all ductwork, where noted on the drawings or details.

B. MATERIAL: 1lb.PSF mass-loaded, limp vinyl with a layer of reinforced aluminum foil facing on one side and 1" thick quilted fiberglass decoupler batting on the other side. BRD Noise & Vibration Control LVQ-210-LAG or equal.

C. INSTALLATION: Duct wrap shall be 25/50 rated for fire and smoke spread. Installation shall be performed on clean, dust free ductwork. Field cut and apply with fiberglass batting on the inside of wrap. Seams shall be overlapped by 4". 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. Trim the quilted portion of the wrap from the top layer of each 4" butt joint. Secure the overlap with acrylic-based spray contact adhesive. Provide nylon or metal banding on either side of each seam. Banding shall be snug but shall not compress duct wrap.

END OF SECTION

SECTION 23 08 00 COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for HVAC systems, assemblies, and equipment.

B. Related Sections:

01 Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

C. The cost of the Commissioning Authority shall be paid directly by the Owner.

1.3 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority

C. HVAC: Heating, Ventilating and Air Conditioning

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

E. TAB: Test and Balance or Test and Balance Contractor

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting and balancing review and coordination meetings.

D. Participate in HVAC systems, assemblies, equipment and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period (Test and Balance Contractor).

1.5 CxA'S RESPONSIBILITIES

A. Provide project-specific construction checklists and commissioning process test procedures for actual HVAC systems, assemblies, equipment, and components to be

furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.6 COMMISSIONING DOCUMENTATION

A. Contractor shall provide the following information to the CxA for inclusion in the commissioning plan:

01 Submittals, systems manuals, and other documents and reports.

02 Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.

03 Schedule for completing manufacturer's prestart and startup checklists for HVAC systems, assemblies, equipment, and components to be verified and tested.

04 Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.

05 Notification that HVAC systems, subsystems, equipment and associated controls are ready for testing.

06 Test and inspection reports and certificates.

07 Corrective action documents.

08 Testing, adjusting and balancing reports.

1.7 SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC testing shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC Subcontractor, Testing and Balancing Contractor, and HVAC Instrumentation and Control Subcontractor shall prepare detailed testing plans,

procedures and checklists for HVAC systems, subsystems and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.2 TESTING PREPARATION

A. Contractor shall certify that HVAC systems, subsystems and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Contractor shall certify that HVAC instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. TAB Contractor shall certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Contractor shall set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.3 TESTING AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing work, Test and Balance Contractor provide copies of reports, sample forms, checklists and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of testing and balancing work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC systems at the direction of the CxA.

01 The CxA will notify Testing and Balancing Contractor 5 days in advance of the date of field verification. Notice will not include data points to be verified.

02 The Testing and Balancing Contractor shall use the same instruments (by model

and serial number) that were used when original data were collected.

03 Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.

04 Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.4 HVAC SYSTEMS, SUB-SYSTEMS AND EQUIPMENT TESTING PROCEDURES

A. Boiler Testing and Acceptance Procedures: Testing requirements are specified in Division 23 Boiler Sections. Provide submittals, test data, inspector record, and boiler certification to the CxA.

B. HVAC Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections "Direct Digital Control for HVAC" and "Sequence of Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 23 piping Sections. HVAC Subcontractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

01 Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.

02 Description of equipment for flushing operations.

03 Minimum flushing water velocity.

04 Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, rooftop units, energy recovery equipment and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. HVAC Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC terminal equipment and unitary equipment.

END OF SECTION

SECTION 23 21 13 HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 GENERAL REQUIREMENTS

A. Construct all piping systems in accordance with applicable ASME Codes.

B. Piping shall be installed 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 and to minimize water drainage requirements. Provide a vent valve at the topmost part and a drain valve at the lowest part of all water piping systems. Bull head Tee arrangement is not acceptable.

C. All piping, fittings and valves shall be manufactured in the United States of America.

D. Provide pipe sleeves for all insulated piping passing through a wall and all piping passing through a floor above grade.

1.3 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.

B. PRESSURE TEST METHOD: Use method suitable for type of piping system being tested. Pipes that will contain water shall be leak tested with water in the piping system. 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 125 psig. Maintain pressure for 8 hours. During this test period, inspect all pipe fittings and accessories in the piping and eliminate all leaks. Contractor shall inform the Engineer’s representative when testing is to be perform so he may observe methods and results.

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.

1.4 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.

B. APPEARANCE: The finished weld shall have no surface voids and present a raised bead at the joint. Wire brush joint for a finished appearance. 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.

PART 2 - MATERIALS AND METHODS

2.1 CHILLED AND BUILDING HEATING WATER PIPING

A. Schedule 40 black steel pipe and fittings, long radius elbows, screwed, welded or Victaulic 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.

2.2 CONDENSATE DRAIN PIPING

A. Schedule 40 galvanized steel or Type "L" copper with solder wrought fittings brazed.

2.3 GAS RELIEF AND MISCELLANEOUS PIPING

A. Schedule 40 galvanized steel or Type "L" copper with solder wrought fittings brazed.

2.4 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. Particularly note the special drain lines required for condensing boilers.

B. MISCELLANEOUS DRAINS: Provide copper drain line to floor drain from automatic air vents, backflow preventers, relief valves and other equipment with automatic drains.

2.5 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 elbows on all pumped lines.

2.6 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

END OF SECTION

SECTION 23 21 16 HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 GENERAL REQUIREMENTS

A. All valves shall be manufactured in the United States of America.

PART 2 - MATERIALS AND METHODS

2.1 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 balancing service. Provide chain operators with guide for all valves 6" and larger, located higher than 8 feet located in the main mechanical room or boiler room. 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-Y, Nibco W-920-W or Mission "Duo-Check"

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

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 except heating water valves shall have Nibco Nibseal system installed.

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: Apollo, Crane, De Zurik, Hammond, Grinnell, Nibco and Stockham

2.2 STRAINERS

A. STRAINERS: Iron body, Y pattern basket type, line size with a 20 mesh Monel screen unless indicated otherwise. Size for a maximum of 2 PSIG pressure drop. Provide ball valve with hose end to 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

2.3 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 shall be approximately 10 PSI above normal maximum system operating pressure; except valves on hot water boilers to be rated at 30 PSI. Valve shall have a capacity not less than rated output of boiler.

C. CAPTIVE AIR EXPANSION TANKS: 125 PSI rated, captive air type with charging valve and replaceable bladder designed for 100% acceptance.

D. AUTOMATIC AIR VENTS: Bell & Gossett No. 107A high capacity vent, 150 psi rating, with shut-off cock. Install 1/2" copper tube overflow line extended to a suitable drain point.

E. MANUAL AIR VENTS: 1/2” ball valve with plug.

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

G. AIR DIRT ELIMINATION / DECOUPLER: 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. Unit shall provide hydraulic bridge between primary and secondary pumping systems. Taco Model 5900

Plus

H. ACCEPTABLE MANUFACTURERS: Aurora, Bell & Gossett, Keckley, McDonnell-Miller, Taco, Thrush and Wood Industrial Products.

I. 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.

J. GAGES: 4½" dial diameter, bottom connected, flangeless, moisture and dust proof case with blowout plug, screw rings and glass crystal. Movement shall be silicone dampened, bronze brushed rotary movement. Pressure range 0 to 150% of system working pressure. Provide brass “T” handle shut off cock for each gage with minimum rating same as gage. Acceptable Manufacturers: Ashcroft, Marsh, Marshalltown, Scientific, Trerice, Weiss or Weksler.

K. THERMOMETERS: Outdoor thermometers shall be cast brass or cast aluminum case with brass separable sockets (with extension neck for insulated piping); red reading non-Mercury type with 9" scale for maximum and minimum temperature 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. Equal thermometers by American, Marshalltown, Scientific, Taylor, Trerice and Weksler are acceptable.

L. 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.

END OF SECTION

SECTION 23 21 23 HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - EQUIPMENT

2.1 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: Pump motor shall be totally enclosed fan cooled (TEFC) type. 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 00.

E. STARTER: Pump starters shall be provided separately from the pump. "Smart" pumps with integral VFD are not allowed. Reference the starter schedule on the drawings for starter type requirements.

F. ACCEPTABLE MANUFACTURERS: Armstrong, Aurora, Bell and Gossett, Patterson, and Taco.

END OF SECTION

SECTION 23 23 00 REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 GENERAL REQUIREMENTS

A. Construct all piping systems in accordance with applicable ASME Codes.

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.

C. All piping, fittings and valves shall be manufactured in the United States of America.

PART 2 - MATERIALS AND METHODS

2.1 REFRIGERANT PIPING

A. GENERAL: 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 manufacturer of the equipment being served. Do not install piping until this drawing is submitted and approved.

B. MATERIALS:

01 PIPE: Type "L" copper ACR tubing.

02 FITTINGS: Wrought copper streamlined, long radius sweat fitting.

03 SOLDER: Sil-Fos, 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: Install 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. Provide supports made for copper refrigerant piping.

END OF SECTION

SECTION 23 25 13 HVAC WATER TREATMENT FOR CLOSED HYDRONIC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 CLOSED SYSTEM WATER TREATMENT

A. GENERAL: Contractor shall clean and flush chilled and heating water systems. After cleaning, fill with clean, treated water per this specification.

B. EQUIPMENT: Provide Vector Industries Model FA 900 filter feeder with legs and stainless steel sock enclosure, drain valve, ball type shut-off valves, 50 micron filter and flow indicator and necessary accessories for the chilled and heating water systems. Unit for heating water system shall be suitable for 240° F water temperature. Pipe filter feeders across the system pumps. Flow rate through filter feeder shall be adjusted to equal 1% of system flow.

C. CLEANING METHOD AND WATER TREATMENT CHEMICALS:

01 General Procedure: The chilled and hot water systems shall be flushed and all debris, rags and foreign objects from construction shall be removed from equipment, traps, etc. System drains shall be located at low points and preferably as far from the fill point as practical. Drain valves shall be minimum 3/4” ball valves. Do not use hose bibbs as drain valves. When system is being cleaned and flushed, do not circulate water through coils, control valves or flow control valves. Install temporary by-pass hoses between isolating and balancing valves at coils to allow re-circulation. Install temporary spool pieces at control valve locations in mains during the flushing and cleaning process. Temporarily connect dead-end supply and return headers, even if not shown on the drawings, and provide terminal drains in bottom of pipe end caps or blind flanges. Strainers at coils only shall be removed until flushing is complete. Strainers at pumps shall remain in place to protect pumps and equipment. Clean strainers frequently during the circulation process. When flushing and cleaning is finished, complete piping connections. Remove temporary hoses and spool pieces, install strainers or strainer elements. When systems are refilled with clean water, circulate that water for 24 hours, then clean and re-install strainers or strainer elements.

02 Phase 1 - Initial Flushing of the System: Remove loose dirt, mill scale, weld

heads, rust and other deleterious substances without damage to system components. Open valves, drains, vents and strainers at all system levels during flushing procedures. Flush system until “potable water clear” and particles larger than 5 microns are removed. Dispose of water in an approved manner.

03 Phase 2 - Cleaning of the Piping System: Remove without chemical or mechanical damage to any system component, adherent dirt (organic soil), oil grease (hydrocarbons), welding and soldering flux, mill varnish, piping components, rust (iron oxide) and other deleterious substances not removed by initial flushing. A solution of Allegheny BC88 liquid piping cleaner shall be circulated in the system for a minimum of 48 hours according to a procedure recommended by the chemical company. Dosage: 5 gallons per 1000 gallon system water. After circulating cleaner solution, drain system as fast as possible to remove suspended solids. Dispose of water in an approved manner.

04 Phase 3 - Refill system, and circulate clean water for a minimum 24 hours with a constant bleed off drain/refill rate of approximately 6 gpm to flush remaining solids. Operate valves to dislodge any debris in valve body. Flush system until “potable water clear” and particles larger than 5 microns are removed.

05 Submit status report upon completion of each phase of work on each system. Owner’s representative shall be present to observe cleaning of piping systems at each phase.

06 After ensuring the system water is clean, add Allegheny CST375 corrosion inhibitor through pot feeders to leave closed systems in proper pH condition. Leave system at 1 gallon per 1000 gallons of water concentration. Circulate water with all control valves open for 24 hours to ensure proper mixing.

07 The system water at final inspection will be certified in writing as to cleanliness and final treatment by the water treatment supplier to the Mechanical Contractor.

D. ACCEPTABLE WATER TREATMENT COMPANIES: Worth Hydrochem (District preferred treatment provider)

END OF SECTION

SECTION 23 29 00 LOW-VOLTAGE CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 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. VFD shall be designed to allow the VFD to be located up to 200 feet from the controlled motor.

B. DIMENSIONS: VFD module shall have a minimum 2:1 height- to-width ratio.

C. FEATURES:

01 Two 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.

02 NEMA 1, wall mounted enclosures except provide NEMA 12 enclosures in chiller or boiler rooms.

03 Digital keypad with LCD screen for entry of set points

04 Panel mounted start-stop control as well as 0-10 VDC and 4-20 ma interface to standard energy management systems.

05 Unit shall operate normally with input up to 30% over voltage and 35% under voltage

06 Inherent power factor correction to .95.

07 Field adjustable acceleration and deceleration times.

08 0-120 Hz controlled speed range with adjustable maximum and minimum stops. For direct drive motors set maximum speed per the equipment submittal

requirements.

09 Safe shutdown and immediate restart after a power outage.

10 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.

11 MOV's for transient voltage protection

12 Provide 115-volt control transformer to interface with vibration switches and other control devices.

D. PROTECTIVE CONTROLS (both automatic and bypass):

01 Overvoltage and undervoltage.

02 Ground fault.

03 Phase loss or failure.

E. NAMEPLATES: Identify each VFD with an engraved nameplate showing load served and the maximum horsepower rating.

F. STARTUP: A factory trained service technician shall startup and test each drive. Technician shall contact Engineer prior to startup to obtain special settings that may be required for primary pumps, cooling tower, direct drive air handling units 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.

G. SUBMITTALS: Provide complete information to confirm compliance. Also provide certified noise data showing that the drive does not exceed preferred "RC" as listed in 1995 ASHRAE HVAC Applications, Chapter 43 Sound and Vibration Control, Table 2 Criteria for Acceptable HVAC Noise in Unoccupied Rooms.

H. ACCEPTABLE MANUFACTURES: ABB

2.2 MOTOR STARTERS

A. GENERAL: Provide an individual controller for each motor. Packaged type equipment such as rooftop units and chillers come with starters provided by the equipment manufacturer. Certain motors as noted on the Drawings require variable frequency drive.

B. ENCLOSURES: Provide NEMA 1 for standard installations and NEMA 4X for installations outdoors and wet areas. Provide combination starter disconnect switch where shown on the drawings.

C. AUTOMATIC STARTERS: Each starter component shall be sized in accordance with NEMA Standards. 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, ensure the appropriate trip unit is provided in the Size 1 starter so the sensed wire does not have to be double looped through the sensing coil.

D. POWER FACTOR CORRECTING CAPACITORS: Certain motors as noted on the Drawings shall have starters with integral power correction capacitors, selected to ensure a .95 or better power factor for the motor circuit.

E. NAMEPLATES: Identify each device with an engraved nameplate showing equipment

served. Attach with two screws.

F. FINISH: Standard.

G. ACCEPTABLE MANUFACTURERS: Allen-Bradley, Cutler-Hammer, General Electric, Franklin and Square D

END OF SECTION

SECTION 23 31 00 HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 SHEET METAL SHOP DRAWINGS

A. Submit Shop Drawings for all ductwork, showing coordination with fire sprinkler piping, and mechanical, electrical, plumbing and structural components. The mechanical, electrical, plumbing and fire sprinkler contractors shall sign off on the final coordination drawings. Do not fabricate any sheet metal prior to receiving an approved shop drawing from the engineer. The shop drawing shall include a construction details booklet and a pdf's of the coordination drawings and the booklet. Comments and approval will be noted on the pdf's and returned. Contractor shall make copies of the approved shop drawing for his use in the field.

1.3 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 installed location of all structural components, piping, conduit and equipment is consistent with the coordination drawing. Verify that all ductwork will fit the spaces indicated on the coordination drawing and make any necessary adjustments prior to fabrication or installation of any ductwork.

C. The exact location of all registers, grilles or ceiling outlets shall be verified by the Architect before roughing-in. Reference shall be made to the architect's reflected ceiling plan for locating ceiling outlets.

D. Ducts shall be installed in a neat and workmanlike manner.

1.4 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.

1.5 ADJUSTMENTS AND CORRECTIONS

A. Balance all systems of ductwork including exhaust systems to obtain the air quantities indicated for each inlet and outlet within ±10%. Air quantities shall be further adjusted as required to obtain uniform temperatures in the spaces.

PART 2 - MATERIALS AND METHODS

2.1 LOW PRESSURE DUCTWORK

A. Furnish and install all supply, return, exhaust, outside air and other ductwork shown complete with splitters, extractors, dampers and other required devices. All ductwork, supports and bracing, shall be constructed of new grade, lock forming quality, G-60 or better galvanized steel sheets. All ductwork sheet metal shall be made in the United States of America.

B. Dimensions of duct work shown on Drawings are inside air stream dimensions. Allowances have not been made for internal duct insulation. Provide equivalent sized duct of different aspect ratio to accommodate ceiling cavity conditions.

C. Ductwork shall conform to 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.

D. 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.

E. 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°).

F. Ductwork shall be constructed to operate at the design system pressure. Generally, ductwork shall be constructed for 2” static pressure. Ductwork downstream of VAV boxes, fan coil units and fans may be 1” static class ductwork. Primary ductwork from a variable air volume air handling unit supplying terminal boxes shall be constructed in accordance with Section 2.2 Medium Pressure Ductwork.

G. Square turns shall be equipped with airfoil turning vanes built to SMACNA Standards. Provide radius turns for elbows less than 90°.

H. Support ductwork with 1" wide x 20 gage galvanized steel straps spaced 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.

I. 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.

J. Flexible duct shall be U. L. Listed 181 Class I air duct with CPE inner liner, fiberglass insulation with a C=.23, bi-directional reinforced metalized vapor barrier outer jacket and 10" 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 8M 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.

K. 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.

L. The minimum distance between the CVT/VAV box and the first tap shall be 54".

M. Sheet metal contractor shall install control system devices that are attached to ductwork. This includes control dampers and sensors.

N. Provide access doors for cleaning ductwork before and after coils, filters, fans and dampers. Locate doors so that the minimum numbers possible are used. Provide removable end caps on ducts.

2.2 MEDIUM PRESSURE DUCTWORK

A. Furnish and install medium pressure round and oval ducts that connect VAV medium pressure AHU's and their associated VAV/CVT boxes as indicated on the Drawings. 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. All ductwork shall be externally insulated per the Specifications. All turning vanes shall be heavy gage, double thickness type.

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 a 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 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.

H. 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 Flexible

Tubing Corporation Thermaflex, insulated Type M-KC, U. L. approved. 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 stainless steel, adjustable bands (hose clamps). Secure outer cover with nylon wire tie strap.

I. Duct work 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.

J. Access panels shall be Nailor Industries Model 0800-M1 insulated access panels with camlocks and safety chain.

2.3 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: Duct material shall be black steel, minimum 16 gage, with grease tight, continuous external welded joints.

D. DISHWASHER HOOD EXHAUST DUCT: Duct material shall be 18 gauge, Type 316L stainless steel, watertight construction with continuous external welded joints.

2.4 FUME HOOD DUCTWORK AND OTHER DUCTWORK NOTED TO BE STAINLESS STEEL

A. Duct material shall be 18 gauge, Type 316L stainless steel, watertight construction with external welded joints.

2.5 DUCTWORK FOR OUTSIDE AIR/RELIEF HOODS AND FANS

A. Where hoods or fans are shown open to mechanical room, shop and similar locations, provide a 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.

2.6 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. Plenums shall be 12” unless noted to be larger.

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.

2.7 DRYER EXHAUST DUCTWORK

A. Provide 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. Provide residential style dampered and hooded wall outlet for discharges through walls. Roof discharge cap shall have baffled outlet, without bird screen similar to Penn Pul-Air.

2.8 SCREENS

A. Furnish and install screen on all duct and fan 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.

2.9 WALL AND FLOOR PENETRATIONS

A. GENERAL: Duct and return air opening penetrations of floors and fire rated walls shall have fire dampers installed per their listing.

B. MATERIALS: 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.

C. WATER BARRIER: 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.

2.10 SADDLES

A. Provide sheet metal protective saddles at all pipe supports for insulated piping. Refer to Insulation Section.

2.11 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.

B. CONSTRUCTION: 16-gauge 304/316 stainless steel suitably stiffened, with minimum 2" perimeter lip and all joints soldered watertight. Provide connection and overflow drain to suitable location.

END OF SECTION

SECTION 23 33 00 AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 DAMPERS

A. GENERAL: Provide dampers where shown on Drawings and as necessary to control air flow in all supply and outside air ducts. Provide multi-blade volume dampers in all zone ducts of multi-zone air handling units. Provide access doors in sheetrock ceilings to all access to damper operators.

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. FLEX TAP CONNECTIONS: Taps on rectangular low pressure ducts for flexible connections to diffusers 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.

E. DAMPER ADJUSTING DEVICES: Each splitter or volume damper shall be fitted with an adjusting device extending beyond external duct insulation.

01 ACCESSIBLE CEILINGS: Ventlok #641 regulators attached directly to duct and location marked in ceiling as approved.

02 NON-ACCESSIBLE CEILING: Regulators exposed. Ventlok #666 rods and #607 end bearings.

2.2 FIRE DAMPERS

A. GENERAL: 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. DUCT DAMPERS: Construction shall conform to requirements of NFPA Pamphlet No. 90A with recommended steel sleeves and fusible links. Dampers shall be U. L. labeled. 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. 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.

C. CEILING DAMPERS: 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.

D. ACCEPTABLE MANUFACTURERS: Greenheck, Nailor, Pottoroff, Ruskin and Safe-Air

2.3 SMOKE DAMPERS

A. GENERAL: 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). Install in accordance with the U. L. Listing including duct sleeve. Damper blades shall be airfoil type for low pressure drop and low noise when in the open position.

B. OPERATOR: 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. COMBINATION DAMPERS: Dampers noted to be combination smoke and fire shall have fusible link assembly to close damper on elevated temperature.

D. ACCEPTABLE MANUFACTURERS: Smoke dampers shall be Nailor Model 1211. Combination dampers shall be Nailor Model 1221. Equivalent dampers by Greenheck, Pottoroff, Ruskin and Safe-Air are acceptable.

2.4 ACCESS DOORS TO FIRE AND SMOKE DAMPERS

A. GENERAL: 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. CONSTRUCTION: Construct access door airtight and conform to recommendations of NFPA and SMACNA.

C. INSTALLATION: Opening of access panel shall be within 12” of the damper to allow resetting of the actuator.

2.5 FLEXIBLE DUCT

A. GENERAL: 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.

B. INSTALLATION: 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. 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.

C. ACCEPTABLE MANUFACTURES: Flexmaster Type 3M or Thermaflex M-KE

2.6 FLEXIBLE CONNECTIONS BETWEEN AHU, VAV BOX OR FAN AND DUCTWORK

A. CONSTRUCTION: Flexible connections shall be made from neoprene coated, woven glass fiber material, 30 ounces per square yard.

B. INSTALLATION: 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

2.7 ACOUSTICAL LINER

A. GENERAL: Provide 1" thick acoustical lining in return air ducts and return air plenums. Do not install in any supply air duct or kitchen return air duct.

B. MATERIAL: Owens-Corning "Aeroflex Duct Liner" or equivalent by CertainTeed; 1½ pound per cubic foot density, neoprene faced, "K" value not more than .27 at 75° F mean temperature difference.

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.

2.8 SOUND ATTENUATORS

A. 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.

B. 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

C. PRESSURE DROP: Silencer design must limit pressure drop to .1" w.g. based on 1000 feet per minute face velocity.

D. INSTALLATION: Attenuators shall be installed in galvanized sheet metal wall sleeve and sealed with duct sealant to prevent air leakage.

E. ACCEPTABLE MANUFACTURERS: AeroSonics, Anemostat, Buensod, Commercial

Acoustics, IAC, Koppers, Rink, Dynasonics , United McGill, ***Price*** and Vibro-Acoustics.

END OF SECTION

SECTION 23 34 00 HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - EQUIPMENT

2.1 ROOF FANS AND VENTS

A. GENERAL: 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.

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. Fans for fume hoods and prep rooms shall have acid resistant coating and explosion-proof construction.

C. DRIVE: 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 fan 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. Relief vents shall barometric damper.

I. ACCEPTABLE MANUFACTURERS: Acme, Cook, Greenheck, Penn-Barry, S&P and Twin City

2.2 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. INLINE FANS: Direct or belt drive as noted with fan wheel and motor assembly mounted on hinged side access panel. Fan wheel shall be aluminum backward inclined, non-overloading centrifugal type with matching deep venturi cone. Interior of housing shall be fiberglass insulated for sound attenuation. Provide automatic backdraft damper and fan installation hardware for application shown.

C. ACCEPTABLE MANUFACTURERS: Acme, Cook, Greenheck, Penn-Barry, S&P and Twin City

END OF SECTION

SECTION 23 36 00 AIR TERMINAL UNITS

GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 VARIABLE AIR VOLUME BOX

A. GENERAL: Box shall be a pressure independent, single input box and built-in sound attenuator. Maximum casing leakage shall be 2 percent at 3” inlet pressure. Boxes shall have the schedule air flow at a maximum of .5" static pressure differential and an NC rating of 25 or less.

B. CONSTRUCTION: The assembly casing shall be constructed of 20 gage galvanized steel, internally lined with 1½", 1½ pound density fiberglass insulation meeting NFPA 90A requirements and UL 181 erosion requirements. Attenuator section shall have 2” thick insulation. Input connection shall be round or oval stub connections for flexible ducts. Outlet connections shall have S and Drive connection for sheet metal duct connection.

C. CONTROLS: Input shall be electronic operated. Damper shall position damper to normally open. Damper operator, control cards and transformers shall be provided by controls supplier, installed by box manufacturer. Controller shall maintain scheduled air flow within 5 percent, with static pressure variation between .5” to 2.0” w.g. Air flow sensor shall be aluminum, multi-point cross flow center averaging sensor with external taps for air flow readings with corresponding chart/label mounted on the box.

D. DAMPER: Damper blades shall be extruded aluminum or 20 gauge galvanized steel keyed to shaft and have a maximum leakage of 2% at 3" static pressure.

E. HEATING COIL: Hot water heating coil shall be minimum two row, copper tube, aluminum fin construction.

F. ACCEPTABLE MANUFACTURERS: Carrier, Johnson Controls, Krueger, Metalaire, Nailor, Price, and Titus

END OF SECTION

SECTION 23 37 13 AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 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 reasonable 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, Nailor, Price and Titus.

END OF SECTION

SECTION 23 37 16 FABRIC DUCT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 FABRIC DUCT AIR DISTRIBUTION SYSTEM

A. Provide fabric duct air distribution as shown on the Drawings.

B. Fabric duct shall be standard round shape with high-throw air distribution system with internal flow control devices to ensure proper distribution for this application.

C. Provide metal to fabric adapter, and fabric elbows, tees and offsets to form the duct layout shown.

D. Duct shall be 100% flame retardant polyester treated with antimicrobial agent from manufacturer. Material shall be 6.5oz/yd² minimum. Material shall be permeable for condensate prevention (3cfm or less). Standard color selected by Owner.

E. Air dispersion: duct shall have directional, low velocity air dispersion. Duct material shall have micro-perforations.

F. Duct suspension: suspension shall be single plastic coated stainless steel cable 1.25" above 12 o'clock position of ductwork. Duct shall be attached to cable using one single row of plastic hooks spaced 20". Cable support hangers shall be 16ft oc minimum.

G. Duct reinforcement: duct shall be provided with aluminum internal rings, installed in duct at factory and capable of holding duct 100% open with zero static pressure.

H. Manufacturer shall provide computer analysis of their proposed duct system showing proper air distribution for the specific application on this project.

I. Acceptable Manufacturers: Ductsox, Prihoda, Ke-Fibertec

END OF SECTION

SECTION 23 41 00 PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 AIR FILTERS

A. GENERAL: Provide multiple sets of air filters for all supply air handling equipment for use during construction. During construction provide an additional pre-filter consisting of roll filter media installed across the air intake of the air handling equipment. 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. Provide a final set of new filters at Substantial Completion for Owners use, including installation when necessary.

B. FILTER MEDIA: 2" thick, Farr Type 30-30 MERV 13 efficiency, pleated, disposable type filter.

END OF SECTION

SECTION 23 51 00 BREECHINGS, CHIMNEYS AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

PART 2 - MATERIALS AND METHODS

2.1 FLUE VENTS

A. GENERAL: Required for all gas fired equipment.

B. LARGE WATER HEATER AND BOILER FLUE PIPE: U. L. Listed, pressure rated, double pipe with, .025" thick AL29-4C stainless steel inner jacket, 304 stainless steel outer jacket and a minimum of one inch air gap between pipes to limit surface temperature to 160° F.

C. FURNACE FLUE PIPE: Double pipe galvanized steel with .035" thick stainless steel inner liner and air space between inner and outer pipes. Metalbestos Model DF.

D. CAPS: Galvanized steel, Breidert (or similar Acme or Triangle) Type L on stack extension above flashing base. Bottom plate of cap shall be higher than any parapet wall within 10 feet and in no case less than four feet above the roof. Provide ventilated roof thimble at roof penetration.

E. CLEARANCES: Maintain adequate clearance from combustible materials to prevent fire hazard. Provide thimble for pipe passing through combustible materials.

F. SLEEVES: Provide airtight sleeves around all vents passing through ceiling cavity or plenum spaces to prevent flue gases from escaping into cavity space.

G. ACCESSORIES: Provide support brackets and collars, rain entrainment section with 1" drain, rain collars and other accessories for a complete system installation. Equipment that recommends installation of a barometric damper, provide damper installed in a "T" section near the equipment flue connection.

H. ACCEPTABLE MANUFACTURERS: Heat Fab, Metalbestos, Metal Fab and Pro-Tech Systems

END OF SECTION

FSECTION 23 52 16 CONDENSING FIRE TUBE BOILER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements included in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 QUALITY ASSURANCE

A. Construct the boiler shell in accordance with the ASME Code for 160 PSI working pressure. The boilers shall be inspected by an authorized inspector during construction.

B. Boiler shall be hydrostatically tested and registered with the "National Board of Boiler and Pressure Vessel Inspectors".

C. Furnish 6 copies of the "Manufacturers' Data Report" for the boiler.

D. Boiler shall be approved as a unit by the CSA and bear the CSA label.

E. The burner, gas train and controls shall conform to the requirements of I.R.I./GE Gap

F. The boiler and installation shall conform to the Boiler Law Rules and Regulations of the Boiler Division of the Texas Department of Labor and Standards.

G. Provide factory tests to check construction, controls and operation of unit.

01 Each boiler shall be completely assembled, wired, fire tested and preset to fire at its rating before leaving the factory.

02 Provide a certificate of the factory fire test.

1.3 CO MONITOR

A. GENERAL: Provide a CO monitor for each room where gas fired boilers are installed.

B. REQUIREMENTS: Monitor shall comply with NFPA requirements and disable heaters within the same room and provide audible alarm. Interconnect sensor to each heater and provide expanders as necessary.

C. MANUFACTURER: US Draft Co Model CGM-505, or equal.

1.4 ACCEPTABLE MANUFACTURERS

A. Raypak X-Vers Boiler

B. RBI Flexcore

C. Lochinvar Crest

1.5 SHOP DRAWING SUBMITTALS

A. Submit data sufficient to show compliance with Contract Documents.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

D. ANSI Compliance: Boilers shall be compliant with ANSI Z21.13 test standards for US and Canada.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.9 WARRANTY

A. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

01 Warranty Period for Fire-Tube Condensing Boilers:

a. Heat Exchanger, Pressure Vessel and Condensation Collection Basin shall carry a 10 year limited warranty against defects in materials or workmanship and 25 years for a failure due to thermal shock.

b. All other components shall carry a one year warranty from date of boiler start up.

1.10 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner’s operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

01 Purpose of equipment.

02 Principle of how the equipment works.

03 Important parts and assemblies.

04 How the equipment achieves its purpose and necessary operating conditions.

05 Most likely failure modes, causes and corrections.

06 On site demonstration.

07 Programming of built-in controllers.

08 Complete tear-down of boiler for repairs, servicing or cleaning.

1.11 CONSTRUCTION

A. Description: Boiler shall be natural gas fired, fully condensing, and fire tube design. The boiler shall be factory-fabricated, factory-assembled, and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

B. Heat Exchanger: The heater exchanger shall bear the ASME “H” stamp for 160 psi working pressure and shall be National Board listed. The heat exchanger shall be constructed of a fully welded 316L stainless steel and of fire tube design. Fire tube shall be capable of transferring 40,000 Btu’s per tube. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. There shall be no banding material, bolts, gaskets or “O” rings in the heat exchanger design.

C. Condensate Collection Basin: Fully welded 316L stainless steel.

D. Boiler shall include an intake air filter with a factory installed air pressure switch. The pressure switch will alert the end user on the screen of the boiler that the intake filter is dirty and needs to be changed.

E. The pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The pressure vessel shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 1.5 psi at 150 gpm.

F. Burner shall be a forced draft single burner premix design with an upper and lower chamber supplied by individual combustion systems. The burner shall be high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The burner shall be capable of the stated gas train turndown of 15:1 without loss of combustion efficiency. The burner shall have an independent laboratory rating for Oxides of Nitrogen (NOx) to meet requirements of the T.C.E.Q.

G. Blower: Boiler shall be equipped with a pulse width modulating blower system to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The burner firing sequence of operation shall include pre-purge, firing, modulation, and post-purge operation.

   01 Motors: Comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

H. Gas Train: The boiler shall be supplied a gas valve designed with negative pressure regulation.

I. Ignition: “Rich Start” hot surface ignition with 100 percent main-valve shutoff with electronic flame supervision.

J. Casing:

   01 Jacket: Heavy gauge primed and painted steel jacket with thumb screw enclosures.

   02 Control Compartment Enclosures: NEMA 250, Type 1A.

   03 Insulation: Minimum ½ inch thick, mineral fiber insulation surrounding the heat exchanger.

   04 Combustion-Air Connections: Inlet and vent duct collars.

1.12 TRIM

A. Safety Relief Valve:

01 Size and Capacity: 75 lb.

02 Description: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.

B. Pressure Gage: Minimum 3-1/2 inch diameter. Gage shall have normal operating pressure about 50 percent of full range.

C. Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.

D. Condensate Neutralization Kit: Factory supplied condensate trap with condensate trip sensor, high capacity condensate receiver prefilled with appropriate medium.

1.13 CONTROLS

A. Boiler controls shall feature a standard, factory installed 7" LCD screen display with the following standard features:

01 Variable Speed Boiler Pump Control: Boiler may be programmed to send a 0-10V DC output signal to an ECM or VFD boiler pump to maintain a designed temperature rise across the heat exchanger. The boiler shall be able to operate in this mode with a minimum temperature rise of 20 degrees F and a maximum temperature rise of 60 degrees F.

02 Password Security: Boiler shall have a different password security code for the User and the Installer to access adjustable parameters.

03 Outdoor air reset: Boiler shall calculate the set point using a field installed, factory supplied outdoor sensor and an adjustable reset curve.

04 Pump exercise: Boiler shall energize any pump it controls for an adjustable time if the associated pump has been off for a time period of 24 hours.

05 Ramp delay: Boiler may be programmed to limit the firing rate based on six limits steps and six time intervals.

06 Boost function: Boiler may be programmed to automatically increase the set point a fixed number of degrees (adjustable by installer) if the setpoint has been continuously active for a set period of time (time adjustable by installer). This process will continue until the space heating demand ends.

07 Time clock: Boiler shall have an internal time clock with the ability to time and date stamp lock-out codes and maintain records of runtime.

08 Three pump control: Boiler shall have the ability to control the boiler pump, system pump and the domestic hot water pump.

09 Anti-cycling control: Boiler shall have the ability to set a time delay after a heating demand is satisfied allowing the boiler to block a new call for heat. The boiler will display an anti-cycling blocking on the screen until the time has elapsed or the water temperature drops below the anti-cycling differential parameter. The anti-cycling control parameter is adjustable by the installer.

10 Night setback: Boiler may be programmed to reduce the space heating temperature set point during a certain time of the day.

11 Freeze protection: Boiler shall turn on the boiler and system pumps when the boiler water temperature falls below 45 degrees. When the boiler water temperature falls below 37 degrees the boiler will automatically turn on. Boiler

and pumps will turn off when the boiler water temperature rises above 43 degrees.

12 Isolation valve control: Boiler shall have the ability to control a 2-way motorized control valve. Boiler shall also be able to force a fixed number of valves to always be energized regardless of the number of boilers that are firing.

13 BMS integration with 0-10V DC input: The Control shall allow an option to Enable and control set point temperature or control firing rate by sending the boiler a 0-10V input signal.

14 Data logging: Boiler shall have non-volatile data logging memory including last 10 lockouts, hours running and ignition attempts and should be able to view on boiler screen.

B. The boiler shall have a built in Cascade controller to sequence boilers. The factory installed, internal cascade controller shall include:

01 Efficiency optimization: The Control module shall allow multiple boilers to fire at minimum firing rate in lieu of Lead/Lag.

02 Front end loading

C. Boiler operating controls shall include the following devices and features:

01 Set-Point Adjust: Set points shall be adjustable.

02 Operating Pressure Control: Factory wired and mounted to cycle burner.

03 Sequence of Operation: Factory installed controller to modulate burner firing rate to maintain system water temperature in response to call for heat.

04 Sequence of Operation: Electric, factory-fabricated and factory-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At 10 deg F outside-air temperature, set supply-water temperature at 180 deg F; at 60 deg F outside-air temperature, set supply-water temperature at 140 deg F.

D. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

01 High Temperature Limit: Automatic and manual reset stops burner if operating conditions rise above maximum boiler design temperature. Limit switch to be manually reset on the control interface.

02 Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manually reset on the control interface.

03 Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.

04 High and Low Gas Pressure Switches: Pressure switches shall prevent burner operation on low or high gas pressure. Pressure switches to be manually reset on the control interface.

05 Proof of Closure Valve: Proof of closure valve (POC) shall prevent the boiler from firing if the POC valve seat is detected open. Upon a call for heat, once the POC valve seat is proven to be closed, the pre-purge cycle will begin and the POC valve will begin to open.

06 Blocked Drain Switch: Blocked drain switch shall prevent burner operation when tripped. Switch to be manually reset on the control interface.

07 Low air pressure switch: Pressure switches shall prevent burner operation on low air pressure. Switch to be manually reset on the control interface.

E. Building Automation System Interface: Factory installed Modbus gateway interface to enable building automation system to monitor, control, and display boiler status and alarms.

1.14 ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

C. Electrical Characteristics:

01 See Drawings

02 Voltage as specified on equipment schedule.

1.15 VENTING

A. Exhaust flue must be Category IV approved stainless steel sealed vent material from one of the approved manufacturers listed in the Installation and Operation manual. Boilers exhaust vent length must be able to extend to 100 equivalent feet.

B. Boiler venting and intake piping configuration shall be installed per one of the approved venting methods shown in the Installation and Operation manual.

C. Boiler shall come standard with a flue sensor to monitor and display flue gas temperature on factory provided LCD display.

D. Boilers using common venting must contact the factory for sizing.

E. Refer to manufacturer's Installation and Operations manual for detailed venting instructions and approved manufacturers.

1.16 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

C. Allow Owner access to source quality-control testing of boilers. Notify Architect 14 days in advance of testing.

PART 2 - EXECUTION

3.1 INSTALLATION

A. Install where shown on the Drawings. Follow manufacturer's instructions.

B. Install equipment in strict compliance with manufacturer's installation instructions.

C. Install equipment in strict compliance with state and local codes and applicable NFPA standards.

D. Maintain manufacturer's recommended clearances around sides and over top of equipment.

E. Provide all electrical control and power interconnect wiring.

F. Provide all fuel gas vent and service piping. Boiler(s) will require Category IV vent material. Boiler requires an exit cone vent termination or a rain cap (depending on manufacturer's requirements).

G. Provide all piping for boiler pipe connections.

3.2 OPERATION TESTS

A. Controls: At the time the boiler is ready to be placed in operation, make a check of the proper operation of all controls, including safety controls and relief valve.

B. Efficiency: Run a flue gas analysis to determine the following at both high and low fire.

01 Establish minimum specified efficiency

02 CO_2, O_2, CO, NO_x (corrected at 3% O_2), Stack Temperature

03 Stack pressures

C. Boiler manufacturer and mechanical contractor to coordinate with BAS contractor that the boiler system is functioning as designed.

3.3 FACTORY START UP:

A. Shall be performed by manufacturer or the manufacturer's representative.

B. Test during operation and adjust if necessary

C. Safeties

D. Operating Controls

E. Static and full load gas supply pressure

F. Gas manifold and blower air pressure

G. Amp draw of blower

H. Submit copy of start-up report to Mechanical Engineer.

END OF SECTION

SECTION 23 64 00 WATER CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 TRAINING

A. Chiller manufacturer shall provide two days of training for two Owner representatives at the manufacturer's factory training facility.

B. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval.

C. This training will be hands-on and classroom type training which will pertain to the purchased equipment. The training shall be a combination of classroom and hands-on training that will give the trainees the ability to completely tear down and overhaul the purchased equipment.

PART 2 - MATERIALS AND METHODS

2.1 AIR COOLED ROTARY/SCREW CHILLER

A. GENERAL: Unit shall be an ARI certified packaged air cooled chiller with two or more screw compressors suitable for outdoor installation. Unit shall have two completely independent refrigeration circuits utilizing R-513A refrigerant. Provide accessories for a complete system including starters, disconnecting circuit breakers, control voltage transformer, controls system and electronic expansion valve. All cold surfaces shall be insulated to prevent condensation. Unit shall be fully charged with refrigerant and oil. Provide security wire guards around the compressor area.

B. COMPRESSOR: Screw type with refrigerant cooled motor. 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. Compressor system shall allow continuously variable capacity from 100% down to 15%, with automatic stopping and restart when load is below 15%. Motor shall have a power factor of 0.9 or greater and have internal electronic overheating protection. Compressor shall have sound reduction enclosures and sound deadening wraps on discharge piping.

C. EVAPORATOR: Evaporator shall consist of a shell with replaceable internal finned tubes, constructed, tested and stamped in accordance with ASME Code for Unfired

Pressure Vessels. Shell shall be fully insulated to prevent condensation. Provide factory installed heat tape with thermostat to protect the evaporator from freezing at ambient temperatures down to -20°F.

D. CONDENSER COIL: All aluminum brazed fin construction microchannel coils. All coils shall be factory coated to resist corrosion.

E. CONDENSER FANS: Fans shall be ultra-quiet propeller design with direct drive motors. Provide fan guards.

F. 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:

01 Unit start-stop switch and operating signal light with provision for automatic start-stop.

02 Internal controls to maintain leaving water temperature.

03 Motor current controller with maximum load selector switch for 40% to 100% full load current to permit manual control of power demand.

04 Digital readout panel indicating condenser, evaporator, lubricating oil and purge pressures, voltage, amps.

05 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.

06 Anti-recycle timer to limit starting to once every 15 minute or as recommended by manufacturers. Mount in either control panel or starter.

07 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 4-20 ma signals.

08 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.

09 Provide a powered 120 volt, ground fault, duplex convenience outlet

10 Provide an interface unit to allow the building energy management system to monitor and control the chiller operation.

G. STARTER: Unit mounted, X-L type, with overload protection in all three legs, single phasing and low voltage protection.

H. 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.

I. SOUND RATINGS: Emitted sound pressure shall note exceed 67 dBA as measured in accordance with AHRI-370-2015 testing procedures.

J. EFFICIENCY: The chiller must meet the minimum efficiency requirements, as outlined in the 2021 IECC, Table C403.3.2(3) Water Chilling Packages:

01 <150 Tons

a. Path A: 10.10 EER, 13.7 IPLV

b. Path B: 9.7 EER, 15.0 IPLV

02 >=150 Tons

a. Path A: 10.10 EER, 14.0 IPLV

b. Path B: 9.7 EER, 16.1 IPLV

03 Additional Requirements: The chiller must exceed the minimum efficiency of either the listed FL EER, or IPLV by 10%.

K. INSPECTION AND TEST: Upon completion of installation, an authorized representative of the manufacturer of the chilling unit shall inspect the installation and certify that the unit ready for operation. He shall supervise the starting and observe the operation and performance of the equipment.

L. WARRANTY: Provide a ***five*** year warranty (parts and labor) for total unit, including refrigerant. All replacement parts shall be newly manufactured. For each chiller provide factory certificates listing chiller model, serial number and warranty information in the close out documents.

M. ACCEPTABLE MANUFACTURERS: Provide line item pricing for each chiller on the bid form on the associated Alternate 3 line. The chillers are not part of the base bid and will be an additive alternate only.

01 Alternate 3-A: Carrier 30XA Mid Efficiency Screw

02 Alternate 3-B: Carrier 30XA High Efficiency Screw

03 Alternate 3-C: Trane RTAF Mid Efficiency Screw

04 Alternate 3-D: Trane ACR High Efficiency Screw

05 Alternate 3-E: York YCIV Mid Efficiency Screw

06 Alternate 3-F: York YVAA High Efficiency Screw

END OF SECTION

SECTION 23 72 23 AIR TO AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 PRODUCT SPECIFICATION

A. Energy Recovery Ventilator (ERV) shall transfer both sensible and latent energy using a total energy wheel. ERV wheels shall be installed within an air handling unit. Reference specification Section 23 73 13 Indoor Air Handling Units and Section 23 74 13 Outdoor Air Handling Units.

01 Wheel Media: The ECW, or enthalpy wheel, shall be constructed of corrugated synthetic fibrous media, with desiccant infused and uniformly and permanently dispersed throughout the matrix structure of the media. Rotors with desiccant coated, bonded, or synthesized onto the media are not acceptable due to delamination or erosion of the desiccant material. Media shall be synthetic to provide corrosion resistance and resistance against attack from laboratory chemicals present in pharmaceutical, hospital, etc. environments as well as attack from external outdoor air conditions. Coated aluminum is not acceptable. Face flatness of the wheel shall be maximized (+/- 0.032 in) to minimize wear on inner seal surfaces and to minimize cross leakage. Rotor shall be constructed of alternating layers of flat and corrugated media. Wheel layers should be uniform in construction forming uniform aperture sizes for air flow. Wheel construction shall be fluted or formed honeycomb geometry to eliminate internal wheel bypass. Wheel layers that can be separated or spread apart by air flow are unacceptable due to the possibility of channeling and performance degradation. The media shall be in accordance with NFPA or UL guidelines. The minimum acceptable performance shall be as specified in the drawings/submittal.

02 Desiccant Material: The desiccant material shall be a molecular sieve, and specifically a 4A or smaller molecular sieve to minimize cross contamination.

03 Wheel Media Support System: The wheel frames shall consist of evenly spaced steel spokes, galvanized steel outer band and rigid center hub. The wheel construction should allow for post fabrication wheel alignment.

04 Wheel Seals: The wheel seals shall be a contact brush seal on both the periphery of the wheel and the face. Seals should be easily adjustable.

05 Wheel Cassette: Cassettes shall be fabricated of heavy duty reinforced galvanized steel or welded structural box tubing. Cassettes shall have a built-in adjustable purge section minimizing cross contamination of supply air. Bearings

shall be inboard, zero maintenance, permanently sealed roller bearings, or alternatively, external flanged bearings or pillow block. Drive systems shall consist of fractional horsepower A.C. drive motors with multilink drive belts.

1.3 QUALITY ASSURANCE

A. The energy recovery cores used in these products shall be third party Certified by AHRI under 84-2020 ASHRAE Standard (Method of Testing Air-to-Air Heat/Energy Exchangers) and AHRI Standard 1060-2018 (Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment) and carries the AHRI certification stamp.

B. The ERV wheel shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of purchase.

PART 2 - INSTALLATION

A. Installation of wheel, housing, and accessories shall be done by air handling unit manufacturer.

END OF SECTION

SECTION 23 73 13 INDOOR CENTRAL STATION AIR HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 SUBMITTALS

A. Provide submittals as outlined in Section 23 00 00 General HVAC

PART 2 - MATERIALS AND METHODS

2.1 CUSTOM AIR HANDLING UNITS

A. DIMENSIONAL COORDINATION: Cabinets shall be designed with a variable aspect ratio in order to fit efficiently into the space allotted in the mechanical design. The manufacturer shall verify fitment prior to bidding. Any unit that is found to be dimensionally incompatible with the space allotted will be rejected during the submittal review phase and unit that is dimensionally compatible shall be provided to the owner at no additional cost.

B. CABINETS: Cabinet shall be of double wall construction with encapsulated 3” thick insulation in both fan and coil sections to prevent unit sweating. The interior liner shall be 20 gauge galvanized with no exposed insulation. Sections and panels shall be bolted together with insulating gasket to prevent sweating at the joints. Exterior wall panels shall be removable and constructed of 16 gage or heavier sheet steel or have internal structural members to prevent damage to unit due to maintenance personnel standing on unit. Exterior of the unit shall be 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 the mechanical room or above ceiling. A rigid, welded framework shall support the panels, coils, and fan. The condensate 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.

C. 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 are

shown on the drawings or described in the temperature controls sequence. Unless noted otherwise, heating coils shall be in the reheat position. Where outside air is shown connecting directly to the unit, provide manual return air damper to set return air/outside air ratio.

D. FANS:

01 Assembly: The fan assembly shall be a single width, single inlet, direct-drive plenum fan(s) with high efficiency welded-aluminum impeller that is dynamically balanced as an assembly. Fan shall be maintenance free throughout its operating life. Fans shall be balanced to G6.3 per AMCA 204. Where multiple fans are used in one AHU, each fan shall have an integral backdraft damper so that if any fan fails, the remaining fans may continue to provide supply air without recirculation within the fan section.

02 Access: Access to motor and fan assembly through hinged access door. Access door shall be sized for removal of entire motor and fan assembly.

03 Integral Airflow Measurement: The fan shall have an airflow measurement system to measure fan airflow directly or to measure differential pressure that can be used to calculate fan airflow. The system shall predict airflow within +/-5 percent total accuracy (device & transmitter) when operating within the stable operating region of the fan curve. On units supplied with multiple direct drive fans, one transmitter is supplied for the total array. The submitted fan airflow performance and noise levels shall not be affected by the installation of the device. Any device that provides an obstruction to the fan inlet will not be accepted.

04 Motor Control Panel: The fan section shall be provided with a factory installed NEMA 1 or NEMA 4 motorized impeller motor control panel. The control panel provides a common externally accessible disconnect means, motor over current protection for each fan and a terminal block for ease of control wiring. For units with multiple fans, the control panel shall allow for disconnection of each individual fan, while also allowing all fans to be drive from a single VFD.

05 Fan Classification: Class III

E. DRIVE: Fan is direct drive with integral fan and motor assembly. Reference fan section above. Motor shall be TEAO type motor.

F. ACCESS DOORS: Provide hinged, double wall, insulated and gasketed access doors with Ventlock 260 or equal handles on both inside and outside of casing. 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 side of the coils, filters and motor/fan assembly.

G. WATER COILS: Coils shall be 5/8”, .035” thick wall copper tube, .008” thick aluminum fin with belled collars, tested at 300 PSI with ARI certified ratings. Coils in outside air pre-treatment section shall have a flexible polymer e-coating (ElectroFin). Coil connections shall be counterflow with supply at the very bottom and outlet at the very top of the coil. Coils shall be drainable, non-trapping circuits. Coil casings shall be stainless steel. Headers shall have drain and vent connections extended to the outside of the unit casing. Mount coils on tracks for easy removal without requiring disassembly of the air handling unit. Install rubber grommets at all pipe penetrations of the cabinet.

H. REFRIGERANT COILS: Coils shall be seamless copper tubing with mechanically bonded aluminum plate fins, designed to conform to ANSI/ASHRAE 15. Coils for two stage systems shall have non-interleaved coil (top and bottom split).

I. FILTERS: Provide filter rack for 2" thick MERV 13 filters, maximum velocity 350 FPM. See specification section for Air Filters.

J. NAMEPLATE: Provide a factory installed aluminum nameplate, permanently mounted with the following information: Unit ID as indicated on the contract drawings, Model Number, Serial Number, Sales Order Number and Date of Manufacture.

K. GERMICIDAL LIGHT: Provide factory assembled and tested UV light assemblies for all AHU. Assembly shall include UV light rack with bulbs. Bulbs shall be high-output, hot cathode, T5 diameter bi-pin type that produces UVC energy at 254 nanometers. System shall include access door kill switches, internal UV light protection of all polymeric materials in direct or indirect contact with UV-C energy, externally mounted on-off switch with lockout that disconnects all power to UV lights, and access door windows for inspection. UV light shall have separate 120V power connection.

L. SUBMITTAL: Provide a 1/4" scale drawing of each AHU room showing proposed unit placement with dashed-in access space required. Clearly indicate 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. All submittals shall be prepared by the Salesman that calls on the Engineer from the successful manufacturer.

M. ACCEPTABLE MANUFACTURERS: Provide line item pricing for each AHU on the bid form on the associated Alternate 2 line. The AHU are not part of the base bid and will be an additive alternate only.

01 Alternate 2-A: Carrier 39CC or equal within the Carrier Corporate family

02 Alternate 2-B: Temtrol

03 Alternate 2-C: Trane (ClimateCraft)

END OF SECTION

SECTION 23 81 00 DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 EQUIPMENT NAMEPLATES

A. Each piece of equipment shall have a stainless-steel nameplate with engraved or stamped 1/32" deep markings identifying manufacturer, model number, serial number, voltage, phase, amperage, refrigerant type, etc. as applicable. Attach to equipment with a minimum of two stainless steel fasteners.

PART 2 - MATERIALS AND METHODS

2.1 AIR COOLED CONDENSING UNIT (ACCU-B1)

A. GENERAL: Unit shall be a variable refrigerant flow (VRF) heat pump. 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: Heat exchanger shall be copper tube with aluminum plate fins, tested at factory at 600 psi minimum, sub-cooler circuit and refrigerant receiver and coil fin guards.

C. COMPRESSORS: Shall be spring mounted, hermetic construction, inverter driven scroll compressor with suction and discharge service valves, hot gas muffler and charging valves, designed utilizing refrigerant R410A. Provide five-year compressor warranty.

D. ACCESSORIES AS FOLLOWS:

01 Line voltage magnetic starter with 3 leg overload protection and winding stat protection.

02 Crankcase heater

03 Low pressure cutout control

04 High pressure cutout control

05 Time delay to prevent compressor short-cycling

06 Time delay relay for cold weather start-up

07 Head pressure controls to allow system operation at 20°F ambient

08 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. ACCEPTABLE MANUFACTURERS: LG, Samsung, Mitsubishi or approved equal.

2.2 MINI-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

01 HOUSING: Cabinet shall be constructed of galvanized steel, bonderized and coated with baked-enamel finish. Provide access panels for ease of service.

02 COMPRESSOR: Fully hermetic reciprocating or scroll type operating with R-410A or Puron 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.

03 CONDENSER FAN: Direct drive propeller type with internally protected, totally enclosed motor.

04 CONTROLS AND SAFETIES: Unit shall have time delay restart, automatic restart on power failure, safety lockout-, high- and low-pressure safeties.

C. EVAPORATOR UNIT

01 GENERAL: Indoor, ducted, multi-position direct expansion fan coil unit complete with electric controls, microprocessor control system and integral temperature sensing.

02 FAN: ECM motor driven fan.

03 COIL: Copper tube aluminum fin with refrigerant metering device. Provide condensate drain pan and drip pan under headers. Provide float switch. Insulated refrigerant and condensate drain piping shall connect to the back of the unit so piping is concealed.

04 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. Unit shall also be controllable directly from the building energy management system with varying schedule and temperature set points.

05 FILTERS: Provide factory supplied, permanent cleanable type filters with rack.

D. REFRIGERANT LINES: Provide factory supplied refrigerant lines connected to the back

of the evaporator unit so lines are concealed.

E. ACCEPTABLE MANUFACTURERS: Carrier/Toshiba, LG, JCI.

1.1 PACKAGED ROOFTOP AIR CONDITIONING UNIT

F. GENERAL: Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and heat pump heating duty. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.

01 Unit shall use A2L refrigerant, R454B.

02 Unit shall be installed in accordance with the manufacturer's instructions.

03 Unit must be selected and installed in compliance with local, state, and federal codes.

G. UNIT CONSTRUCTION REQUIREMENTS:

01 UNIT CONTROLS:

a. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability.

b. Shall utilize color-coded wiring.

c. Shall include a Unit Control Board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, economizer, thermostat, DDC control options, and low and high pressure switches. Controller shall also provide an intuitive means to adjust the indoor fan speed through a simple switch and pot adjustment design.

d. Safeties:

(i) Compressor over-temperature, over-current. High internal pressure differential.

(ii) Low pressure switch.

(iii) Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.

(iv) High pressure switch.

(v) High pressure switch shall use different color wire than the low pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.

(vi) Automatic reset, motor thermal overload protector.

02 QUALITY ASSURANCE:

a. Unit meets ASHRAE 90.1 minimum efficiency requirements.

b. Unit shall be rated in accordance with:

(i) 6 tons and up: AHRI Standards 340/360.

(ii) 5 tons and under: AHRI Standards 210/240.

c. Unit shall be designed to conform to ASHRAE 15.

d. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.

e. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke gen-eration.

f. Unit casing shall be capable of withstanding 500 hour salt spray exposure per ASTM B117 (scribed specimen).

g. Unit shall be designed in accordance with ISO 9001, and shall be manufactured in a facility registered by ISO 9001:2015.

h. Roof curb shall be designed to conform to NRCA Standards.

i. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.

j. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.

k. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.

l. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.

03 CABINET: Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.

a. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 in. minimum, gloss (per ASTM D523, 60°F/16°C): 60, Hardness: H-2H Pencil hardness.

b. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards (210/240 or 340/360) minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2 in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.

c. Base of unit shall have a minimum of four locations for thru-the-base electrical connections (factory-installed or field-installed), standard.

04 Base Rail:

a. Unit shall have base rails on a minimum of 2 sides.

b. and overhead rigging.

c. Holes shall be provided in the base rail for moving the rooftop by fork truck.

d. Base rail shall be a minimum of 16 gauge thickness.

05 Condensate pan and connections:

a. Shall be a sloped condensate drain pan made of a corrosion resistant material.

b. Shall comply with ASHRAE Standard 62.

c. Shall use a 3/4 in. 14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.

06 Electrical Connections:

a. All unit power wiring shall enter unit cabinet at a single, factory prepared, knockout location.

07 Thru-the-base capability.

a. Factory approved, water-tight connection method must be used for thru-the-base electrical connections.

b. No basepan penetration, other than those authorized by the manufacturer, is permitted.

08 Component access panels (standard):

a. Cabinet panels shall be easily removable for servicing.

b. Unit shall have one factory installed, tool-less, removable, filter access panel.

c. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.

d. Handles shall be UV modified, composite. They shall be permanently attached, and recessed into the panel.

e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.

f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

09 Microchannel Coils:

a. Aluminum construction with flat, streamlined tubes with small ports, and metallurgical tube-to-fin bond.

b. Coils leak tested at the factory to verify the pressure integrity

10 Provide E-coated aluminum-fin evaporator and condenser coils:

a. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.

b. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.

c. Color shall be high gloss black with gloss per ASTM D523-89.

d. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.

e. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.

f. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).

g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92).

h. Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.

11 Refrigerant Components:

a. Refrigerant circuit shall include the following control, safety, and maintenance features:

b. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.

c. Refrigerant filter drier - Solid core design.

d. Service gauge connections on suction and discharge lines.

e. Pressure gauge access through a specially designed access port in the top panel of the unit.

f. Suction line accumulator to provide protection in all operating modes from cooling, heating and reverse cycle switching.

g. There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.

h. The plug shall be easy to remove and replace.

i. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines.

j. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.

k. The plug shall be made of a leak proof, UV resistant, composite material.

12 Compressors:

a. Unit shall use one single variable speed compressor for capacity modulation control.

b. Evaporator coils shall be a full active design to help better control comfort latent removal.

c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.

d. Compressors shall be internally protected from high discharge temperature conditions.

e. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.

f. Compressor shall be factory mounted on rubber grommets.

g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

h. Crankcase heaters shall not be required for normal operating range, unless required by compressor manufacturer due to refrigerant charge limits.

13 Filter Section:

a. Filters access is specified in the unit cabinet section of this specification.

b. Filters shall be held in place by a pivoting filter tray, facilitating easy removal and installation.

c. Shall consist of factory installed, low velocity, throw-away 2-in. thick fiberglass filters.

d. Filters shall be standard, commercially available sizes.

e. Only one size filter per unit is allowed.

14 Evaporator Fan and ECM type Motor:

a. Direct Drive Evaporator fan motor:

b. Shall be a ECM motor design.

c. Shall have permanently lubricated bearings.

d. Shall have inherent automatic-reset thermal overload protection.

e. Shall have slow ramp up to speed capabilities.

f. Shall require no fan/motor belts for operation, adjustments and or initial fan speed set up.

g. Fan DC voltage set up on Unit Control Board can eliminate the need of removal of blower access door, required on conventional belt drive systems.

h. Shall be internally protected from electrical phase reversal and loss.

15 Evaporator Fan:

a. Shall be easily set with dedicated selection switch and adjustment pot on unit control board.

b. Shall provide two stage cooling capacity control, the indoor fan speed is automatically controlled to meet the code-compliant <66% low fan speed and 100% at full fan speed operation.

c. Blower fan shall be a Vane Axial fan design with 75% less moving parts than a conventional belt drive system.

d. Shall be constructed of a cast aluminum stator and high impact composite material on stator, rotor and air inlet casing.

e. Shall be a patented / pending design with a corrosion resistant material and dynamically balanced.

f. Shall have slow ramp up to speed capabilities to help reduce sound and comfort issues typically associated with single speed belt drive systems.

g. Shall be a slide out design with removal of a few support brackets.

h. Shall include an easily accessible Unit Control Board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, economizer, thermostat, DDC control options, and low and high pressure switches. Controller shall also provide an intuitive means to adjust the indoor fan speed through a simple switch and pot adjustment design.

16 Condenser Fans and Motors:

a. Condenser fan motors:

b. Shall be a totally enclosed motor.

c. Shall use permanently lubricated bearings.

d. Shall have inherent thermal overload protection with an automatic reset feature.

e. Shall use a shaft-down design on all sizes.

17 Condenser Fans:

a. Shall be a direct-driven propeller type fan constructed of high impact composite mate-rial.

b. Shall have high impact composite blades completely formed into one piece without blade fasteners or connectors and shall be dynamically balanced.

18 Smoke Detectors:

a. Shall be a four-wire controller and detector.

b. Shall be environmental compensated with differential sensing for reliable, stable, and drift-free sensitivity.

c. Shall use magnet-activated test/reset sensor switches.

d. Shall have tool-less connection terminal access.

e. Shall have a recessed momentary switch for testing and resetting the detector.

f. Controller shall include:

g. One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.

h. Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.

i. One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.

j. Capable of direct connection to two individual detector modules.

k. Can be wired to up to 14 other duct smoke detectors for multiple fan shutdown applications.

19 Time Guard Control Circuit:

a. Shall prevent compressor short-cycling by providing a 5 minute delay (±2 minutes) before restarting a compressor after shutdown for any reason.

b. One device shall be required per compressor.

c. Hinged Access Panels:

d. Shall provide easy access through integrated quarter turn latches.

e. Shall be on major panels of: filter, control box, fan motor, and compressor.

20 Condensate Overflow Switch:

a. This sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:

b. Indicator light — solid red (more than 10 seconds on water contact – compressors disabled), blinking red (sensor dis-connected).

c. 10 second delay to break — eliminates nuisance trips from splashing or waves in pan (sensor needs 10 seconds of constant water contact before tripping).

d. Disables the compressors operation when condensate plug is detected, but still allows fans to run for Economizer.

21 2 in. MERV-13 Return Air filters:

a. Accessory kit to field upgrade standard unit filters to 2 in. MERV-13 filters.

22 Phase Monitor Control:

a. Shall monitor the sequence of three phase electrical system to provide a phase reversal protection.

b. Shall monitor the three phase voltage inputs to provide a phase loss protection for the three phase device.

c. Will work on either a Delta or Wye power connection.

23 Two Stage Gas Heat:

a. Natural gas furnace with two stages and 2:1 turndown.

24 Foil Faced Insulation:

a. Throughout unit cabinet air stream, non-fibrous and cleanable foil faced insulation is used.

H. WARRANTY: Warranty shall be for full 5 year term from substantial completion.

01 Warranties shall be full machine parts, labor and refrigerant warranty. All components replaced thru the warranty process shall be new, not rebuilt. Warranty shall also include all miscellaneous materials, travel time, expenses, shipping, refrigerant, oils, lubricants, belts, filters, insulation and any expenses related to service calls required to diagnose and correct warranty issues with equipment.

I. ACCEPTABLE MANUFACTURERS: Carrier, York, Trane.

END OF SECTION

SECTION 25 00 00 GENERAL BAS REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

1.2 INTENT OF DRAWINGS AND SPECIFICATIONS

A. GENERAL: Drawings and Specifications are intended to be complimentary. Any work described in either of them, will be work required under this contract. Where there is a conflict between the Drawings and Specifications it shall be clarified by RFI. Barring clarification prior to bidding the most expensive option shall be included and clarification shall be made during construction. 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. DRAWINGS: The drawings are schematic in nature, intended to 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 and offsets which may be required to fit the system into spaces allotted for them. The Contract shall include these items as required for a complete installation.

C. BASIS OF DESIGN: Equipment that is scheduled is the basis of the design and has been coordinated for space, installation and electrical requirements. Equipment and models from other 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 substitute equipment.

1.3 MATERIALS

A. GENERAL: Manufacturer's printed directions shall be followed for preparing, assembling, installing, erecting and cleaning manufactured materials or equipment, unless otherwise directed. 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. SUBSTITUTION: 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.

C. SUBSTITUTION REQUIREMENTS: 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 drawing to scale showing how the equipment and required access space will fit the available space. Acceptance for bidding does not waive the post bidding requirement for formal submittal and approval.

1.4 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 other sections. The locations of all inserts and openings shall be determined under this Section and coordinated with the other Sections in ample time to avoid cutting new construction.

D. EQUIPMENT AND PIPING SUPPORT REQUIREMENTS: 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.

1.5 ALTERNATES

A. GENERAL: 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.

1.6 PERMIT, FEES AND APPROVALS

A. The contractor shall obtain and pay for all permits and fees to perform his work. He shall 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 from the various insuring and inspection authorities shall also be obtained. Refer to Architectural sections for additional information.

1.7 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 additional compensation shall be allowed for failure to fully understand the requirements.

1.8 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.

1.9 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. Carefully fabricate ductwork and fittings with smooth interior finish to prevent turbulence and generation or regeneration of noise. 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.

1.10 INSTALLATION REQUIREMENTS

A. COORDINATION: 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 to coordinate his work with the total project.

B. WORKMANSHIP: 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.

C. CLEAN-UP: Keep area of operations free from accumulation of waste material or rubbish at all times. All piping above accessible ceilings shall be cleaned of cement, plaster and other construction debris prior to being concealed. The parts of the Mechanical installation which are to be painted or insulated shall be thoroughly cleaned of cement, plaster, grease, oil spots and other materials in preparation for painting or insulating.

D. EQUIPMENT PROTECTION: Do not deliver equipment to jobsite until it is actually needed for installation. Protect equipment from damage due to construction activities and the weather. Equipment allowed to stand in weather will be rejected and Contractor is obligated to furnish new equipment at no cost to Owner.

E. CUTTING AND PATCHING: 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. Where concrete flooring or paving must be cut to install MEP systems, contractor shall take measures to prevent damaging existing underground services. Contractor shall x-ray the area to be saw cut to determine the existence of underground services. When saw cutting, limit the depth of the cut to less than the thickness of the concrete. Breakout the concrete manually with special care in areas of possible underground services.

F. STRUCTURAL STEEL: All structural steel used for the purpose of fabricating equipment supports, pipe supports, pipe guides, pipe anchors 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.

1.11 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.

1.12 SHOP DRAWINGS

A. All submittals shall be submitted in PDF form. Submittal will be reviewed with comments incorporated in this PDF. After final approval, Contractor shall provide a hard copy for use at the project site.

B. 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. Shop drawings shall be approved before installation of the material under consideration. 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.

C. 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. Ductwork shop drawings shall include one printed set of drawings in addition to the PDF. 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:

01 Job name and location.

02 General Contractor's name, address, project manager's name and telephone number.

03 Submitting Sub-contractor's name, address, project manager's name and telephone number.

04 Suppliers company name, address, salesman's name and telephone number.

D. 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.

E. Shop Drawings are required for but are not limited to the following items:

01 HVAC Controls Map, Wiring Diagrams and Sequence of Operation

02 HVAC Controls Devices and Accessories.

03 Control Valves, Dampers and Actuators

F. 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.

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. SEG 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 SEG at a rate of $125/hr for these occurrences.

1.13 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 and are intended to be the Basis of Bid. 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 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 and this Article. If a submittal contains sufficient information to prove compliance with the Contract Documents, then that submittal will be acceptable.

B. All other brands, including any additional names which may be listed as “Alternates” or “Approved Equal” must conform with the specifications, size, accessories, etc. of the first named brand and be subject to Paragraph D and E of this Article. Alternate equipment 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 Paragraph D and E of this Article.

   01 Submitted on Bidder’s letterhead attached to Proposal Form with individual deductive amounts stipulated and the documentation required in Paragraph E-03.

   02 All savings for Owners selection of deductive amounts by acceptance of alternate or substituted items are to be paid to the Owner.

C. All equipment within common group or category shall be same manufacturer.

D. Proposed Substitutions/Approved Equals:

   01 Submitted no less than 14 calendar days prior to bid date.

   02 Submit proposed substitutions with catalog data and/or manufacturer’s shop details indicating all modifications required to conform with specified brand. Include all relevant items necessary to make a determination of equal status or submittal shall be deemed incomplete and rejected.

   03 If submittal contains sufficient information to prove compliance with the Contract Documents, then that alternate submittal will be acceptable. Approved submittals for bidding purposes only will be published by addenda.

E. Substitutions with prior approval:

   01 Submitted on Bidder’s letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in Paragraph B-2.

   02 Owner reserves the right to accept or reject any or all substitution proposals before execution of Contract.

   03 Provide all design/engineering services required to make adjustments in space, systems, utilities, etc. and pay all additional costs of utilities, construction or professional services that may be incurred due to the acceptance of any substitution.

1.14 BAS SYSTEM INSPECTIONS

A. GENERAL: Contractor shall formally request inspections of any and all BAS systems installations. Inspections shall include but not be limited to: rough-in installations, wall cover inspections, above ceiling inspections and final inspection.

B. INSPECTION REPORTS: After each inspection, the Engineer 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 the Architect and Engineer via e-mail.

C. Contractor shall provide a MINIMUM of 48 hour notice prior to requested inspection time, no exceptions.

D. INSPECTION REPORTS: After each inspection, SEG 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 SEG via e-mail. After the signed-off report is returned to SEG, the GENERAL CONTRACTOR shall request a re-inspection by SEG to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, SEG 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 SEG 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. SEG shall be reimbursed $500 by the GENERAL CONTRACTOR for expenses in connection with EACH inspection in addition to the two (2) inspections allowed.

1.15 COMMISSIONING AND TEST AND BALANCE

A. Third party commissioning and an independent test and balance contractor are a part of this project. Commissioning agent and T&B contractor will be under a separate contract directly with Owner. Refer to included specifications for commissioning and T&B.

B. Controls contractor shall work with the Mechanical Contractor to complete the pre-function checklist for the various mechanical devices. Checklists will be supplied by the commissioning agent.

C. Controls contractor shall work with the Mechanical Contractor to perform system tests as required by the commissioning agent in addition to any that are described in these specifications.

1.16 DEMOLITION AND REMODELING

A. In areas of demolition, contractor shall remove all controls devices, cabinets, wiring or hangers not to be reused. Existing controllers shall be offered to the Owner for attic stock, 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 and piping to keep systems operable.

END OF SECTION

SECTION 25 00 10 BAS CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Plumbing Requirements as specified in Sections 23, apply to the work specified in this Section.

PART 2 - MATERIALS AND METHODS

2.1 CLOSEOUT REQUIREMENTS

A. ENERGY MANAGEMENT SYSTEM: 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 shall maintain all of the space temperatures at plus or minus two degrees of set point.

B. AS-BUILT DRAWINGS: 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.

C. CLOSEOUT MANUALS: 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. Bind in 3-ring binders with project name.

D. CLOSEOUT DOCUMENTS: Provide three printed copies of the approved submittal with wiring diagrams, sequences, floor plans and graphics updated to the final installation configuration.

2.2 GUARANTEES AND WARRANTIES

A. TEMPERATURE CONTROLS: 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.

B. POWER METERING: Reference section 25 36 13 Integrated Automation Power Meters.

2.3 SPARE PARTS

A. GENERAL: 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.

2.4 TRAINING

A. TEMPERATURE CONTROLS SYSTEM: Provide 8 hours of instructions on system operation to Owner's personnel during the closeout period of the project. Additionally, the contractor shall supply the Owner with a training DVD that will instruct the Owner's personnel on recommended, detailed, maintenance procedures and troubleshooting of their equipment. Provide an additional 48 hours of instructions over a 3-year period for but not limited to operate interface program, software programming, system diagnostics, hardware installation and repair. No session to be more than 4 hours long with no limit on attendees. Technical support for 3 years over the phone shall be provided at no additional cost to the Owner. The Contractor shall be able to call and diagnose the system from his office.

END OF SECTION

SECTION 25 36 13 INTEGRATED AUTOMATION POWER METERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. The General BAS Requirements as specified in Sections 25, apply to the work specified in this Section.

D. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

E. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

F. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

G. Provide Shop Drawings per Section 25 00 00 and this section.

1.2 RELATED WORK

A. Section 25 00 00 – General BAS Requirements

B. Section 25 00 10 – BAS Closeout Requirements

C. Section 25 50 00 – Direct Digital Control System for HVAC

D. Section 25 95 10 – Sequence of Operations for HVAC Controls

E. Section 26 05 00 – Common Work Results for Electrical

F. Section 26 24 00 – Switchboards and Panelboards

PART 2 - MATERIALS AND METHODS

2.1 SWITCHGEAR ELECTRICAL METERING EQUIPMENT

A. INSTRUMENTATION: Provide fully featured power and energy monitoring system sensing the entire switchgear to be monitored. Meter shall be provided in a fully self-contained external enclosure to be mounted adjacent to the switchgear to be monitored.

01 Equipment:

a. The meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems. The meter shall perform to spec in harsh electrical applications in high and low voltage power systems.

b. The meter shall support 3 Element Wye, 2.5 Element Wye, 2 Element Delta, 4 wire Delta systems.

c. The meter shall accept universal voltage input.

d. The meter's surge withstand shall conform to IEEE C37.90.1.

e. The meter shall be user programmable for voltage range to any PT ratio.

f. The meter shall accept a burden up to 0.018 W at 120 V.

g. The meter shall accept a voltage input range of up to 576 volts Line to Neutral, and up to 721 volts Line to Line.

h. The meter shall accept a current reading of up to 11 Amps continuous.

i. The meter shall have color-coordinated voltage and current inputs.

j. The meter shall have a phasor diagram, through software, that clearly shows wiring status.

02 Display:

a. The meter shall include a three-line, bright red, .56" LED display.

b. The meter must display a % of Load Bar on the front panel to provide an analog feel. The % Load bar shall have not less than 10 segments.

c. The Meter must have a programmable display, which allows for the following programming functions including automatic scroll, screen selection programming, and energy scaling.

03 The meter shall provide a simultaneous voltage and current waveform recorder with internal data storage.

a. The meter shall be capable of measuring/monitoring Volts, Amps, kW, kVAR, PF, kVA, Freq., kWh, kVAh, and kVARh.

b. The meter shall be capable of recording 128 samples per cycle for a voltage sag or swell or for a current fault event.

c. The meter shall have 10MB of internal memory.

d. The meter shall provide pre and post-event recording capability.

e. The meter shall have a programmable sampling rate for the waveform recorder.

f. The meter shall have an advanced DSP design that allows power quality triggers to be based on a 1 cycle updated RMS.

g. The meter shall store waveform data in a first-in, first-out circular buffer to ensure that data is always being recorded.

04 The meter shall have an accuracy of +/- 0.1% or better for voltage and amperes, and 0.2% for power and energy functions. The meter shall meet the accuracy requirements of IEC62053-22 (Class 0.2S) and ANSI C12.20 (0.1 Accuracy Class). The meter shall have a Frequency measurement accuracy of not less than 0.007 Hz.

a. The meter shall provide true RMS measurements of voltage, - phase to neutral and phase-to-phase; and current, per phase and neutral.

b. The meter shall calculate RMS readings, sampling at over 400 samples per cycle on all channels of measured readings continuously, with no cycle blind spots.

c. The meter shall utilize 24 bit Analog to Digital conversion.

d. The meter shall provide THD. Harmonic magnitude recording to the 40th order shall be available for voltage and current harmonics.

05 The meter shall include 2 independent communications ports on the back and face plate, with advanced features as part of the base package.

a. One port shall provide RS485 communication speaking Modbus ASCII, Modbus RTU, or DNP3 protocol through the back plate. Baud rates shall be from 1200 baud to 57600 baud for the RS485 port.

b. The meter shall have a USB port (through the faceplate) as the second standard communication port, which shall allow the unit to be set up and programmed using a laptop computer. Baud rate for the USB port shall be 57600; Modbus ASCII protocol, no Parity, 8 Data bits, and 1 Stop bit shall be supported.

06 The meter shall include up to two (2) independent communications ports using optional Input/Output card slots on the back.

a. The cards shall be capable of being installed in the field, without removing the meter from installation.

b. The meter shall auto-detect the presence of any I/O Option cards.

c. The Option card slots shall accept I/O cards in all of the following formats: 100BaseT Ethernet Communication Card; Four Channel Bi-directional 0-1mA Output Card; Four Channel 4-20mA Output Card; Two Relay Outputs/2 Status Inputs Card; Four Pulse Outputs/4 Status Inputs Card; Fiber Optic Card; IEC 61850 Protocol Ethernet Network Card; RS232/RS485 Serial Communication Card.

d. When provided with the Ethernet Option Card the meter shall include an embedded web server or dashboard allowing remote access and viewing of the metered readings over the building network using any standard web browser, smart phone, or table without the addition of any additional software or licenses.

07 Additional equipment/components:

a. Metering Enclosure (where specified):

1) NEMA1 or NEMA4X rating matching installed location.

2) Internal Voltage Fuses

3) Integral CT/PT shorting block.

4) Integral Control power transformer for power the meter directly from the monitored equipment without requiring a separate circuit.

b. Provide CT/PT compatible with meter and monitored equipment.

c. Where a metering enclosure is not specified, installing contractor shall provide CT shorting block, fuse holders, j-box/enclosure, etc. as required to connect to monitored equipment.

d. Provide all cabling, fuses, and miscellaneous components as required for a complete installation.

08 Acceptable products shall be by **Electro Industries/GaugeTech**:

a. Primary Metering:

1) Primary metering shall be provided at all service entrance equipment and additionally where indicated.

2) Shark 250 Meter with Self-Enclosed Assembly

b. Confirm system voltage prior to ordering equipment.

c. For specific information or questions, contact:

Electro Industries/GaugeTech
1800 Shames Drive
Westbury, NY 11590
Phone: 516-334-0870
Fax: 516-338-4741
www.electroind.com

B. Metering/Monitoring:

01 Primary Metering

a. The monitoring system shall provide readouts for:

1) Current-per-phase

2) Phase-to-neutral voltage

3) Phase-to-phase voltage

4) Neutral-to-ground voltage

5) Phase frequency

6) KVA/KW instantaneous load

7) KVAh/KWh usage over 1-day, 7-days, 30-days, and 1-year.

8) Maximum KVA/KW instantaneous load over the previous 18 months.

9) Power Factor (PF)

10) Total Harmonic Distortion (THD)

b. The monitoring system shall have waveform capture and data logging capabilities including:

1) Harmonics

2) Unbalance

3) Flicker

4) Swell

5) Dip

6) Interruption

02 System shall store historical information of these values for the past thirty days.

03 The monitoring system shall be integrated into the building energy management system and shall provide all of the above monitoring and readout features directly through the building energy management system including waveform capture and historical logging.

C. The display shall be mounted no lower than 45” nor higher than 72” above the floor with clear access in front of the meter.

PART 3 - EXECUTION

3.1 COORDINATION

A. The Controls Contractor shall set up a meeting with the Engineer, Owner and Electrical Contractor to review the desired metering programming and integration.

01 Factory representative shall set up meter per the Engineer's direction and assist the Controls Contractor with integrating into the BAS.

B. Contractors shall coordinate with other trades to install the specified equipment.

01 Electrical Work:

a. Proposed Contractor is required to provide for and coordinate with Electrical Contractor for any, and all required electrical work, including but not limited to, circuiting, conduits, back boxes, and more. The cost for all work by the Electrical Contractor shall be included in the submitted proposal for a complete and operable system.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to job site in OEM's original unopened containers, clearly labeled with the OEM's name and equipment model and serial identification numbers.

B. Store and protect equipment in a conditioned space until installation.

3.3 SYSTEMS INSTALLATION

A. Metering equipment shall be provided under this specification and installed by Division 26.

B. All control wiring and control connections to the BAS shall be by Division 25.

C. All equipment shall be connected according to the OEM's specifications to ensure correct installation and system performance.

3.4 SUBMITTAL DRAWINGS:

A. Provide engineered drawings showing equipment dimensions and connections.

B. Provide installation and wiring drawings for the meter including connections to the building electrical systems.

C. Provide complete equipment cutsheets with proposed equipment and all accessories clearly indicated.

D. All information shall be in pdf format.

E. Reference 25 00 00 General BAS Requirements

3.5 TRAINING:

A. Reference 25 00 10 Closeout Requirements.

3.6 WARRANTY:

A. The meter installation and its proper operation shall be guaranteed for a period of one year after substantial completion and any devices or components which prove to be defective during the guarantee period shall be repaired or replaced without cost to the Owner.

B. The meter shall have a standard 4-year manufacturer's warranty.

C. Factory representative shall include up to two (2) site visits during the warranty period (as needed) to assist in analyzing power quality problems.

D. Reference 25 00 10 Closeout Requirements.

3.7 SERVICE CONTRACT:

A. Reference 25 00 10 Closeout Requirements.

3.8 CLOSEOUT DOCUMENTS:

A. Reference 25 00 10 Closeout Requirements.

END OF SECTION

SECTION 25 50 00 DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 RELATED WORK

A. Section 25 00 00 – General BAS Requirements

B. Section 25 00 10 – BAS Closeout Requirements

C. Section 25 36 13 – Integrated Automation Power Meters

D. Section 25 95 10 – Sequence of Operations for HVAC Controls

E. Section 26 00 00 – General Electrical Requirements

F. Section 26 05 00 – Common Work Results for Electrical

G. Section 26 09 43 – Network Lighting Controls

H. Section 26 24 00 – Switchboards and Panelboards

I. Section 26 29 00 – Low-Voltage Controllers

J. Section 26 32 13 – Packaged Generator Assemblies

K. Section 26 36 00 – Automatic Transfer Devices

L. Section 27 00 00 – General Technology Requirements

M. Section 27 10 00 – Communications Cabling General Requirements

N. Section 27 15 00 – Communications Horizontal Cabling

O. Section 28 13 00 – Security and Access Control System

P. Section 28 31 00 – Fire Detection and Alarm

1.3 GENERAL REQUIREMENTS

A. DESCRIPTION: The Contractor shall provide a Direct Digital Control (DDC) System to monitor and control the HVAC systems in the facility. The monitoring of certain electrical and plumbing systems and equipment shall also be provided as noted in these specifications and associated control points listing.

B. MANUFACTURERS: The control system shall be manufactured by the following controls

companies and be installed by their authorized local representative.

01 Only Factory Authorized System Integrators or Branch Offices shall be permitted to bid, install or commission the listed systems.

02 All integrators must be located within a 100 mile radius of the job site and shall have experience with K-12 projects of similar size and scope within the past 5 years. References and project portfolio must be available upon request.

03 Distribution customers, resellers, or third-party contractors not directly authorized are not permitted to bid or perform work under this section.

04 ALTERNATE 4: Provide line item pricing for each DDC System on the bid form on the associated Alternate 4 line. The DDC System is not part of the base bid and will be an additive alternate only.

a. Alternate 4-A Reliable / Unify Energy Solutions
b. Alternate 4-B Trane Controls / Hunton Group
c. Alternate 4-C ALC / Automated Logic Houston

C. EQUIPMENT: All DDC Temperature Control Equipment shall be the product of the approved controls manufacturer. All control valves shall be by Barber Colman, Belimo, Bray, Honeywell, Johnson, Robertshaw or Siemens. Controls contractor shall provide surge suppression (TVSS) protection for their equipment.

D. WIRING: System shall have a dedicated control network and not rely on the building network other than an interface to allow viewing of the control system. The Electrical Contractor shall provide a 20A, 120-volt power circuit to a single point in each mechanical room. The Controls Contractor shall extend this circuit as necessary to perform the controls functions as specified. Interlock wiring between fire alarm system's shut down relays and mechanical system starters, VFD's and temperature controls devices shall be provided by the Temperature Controls Contractor. All low voltage control and interlock wiring shall be provided by the Controls Contractor. All wiring shall be run in conduit except plenum rated, low voltage wiring above accessible ceilings may be installed without conduit if supported near structure separate from other low voltage systems. The installation of wiring and conduit shall be per the NEC and any special requirements of the electrical sections of these specifications.

E. SUBMITTALS: Provide equipment information, complete wiring diagram, floor plan drawings showing equipment locations (SEC's, power supplies, etc.), sequences of operations and drawings of graphics to be provided. Submittals shall be electronic in pdf format. Refer to submittal requirements in the General HVAC Requirements Section.

F. WARRANTY: 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.

G. CLOSEOUT DOCUMENTS: Provide three printed copies of the approved submittal with wiring diagrams, sequences, floor plans and graphics updated to the final installation configuration.

H. TRAINING: Provide 8 hours of instructions on system operation to Owner's personnel during the closeout period of the project. Additionally, the contractor shall supply the Owner with a training DVD that will instruct the Owner's personnel on recommended, detailed, maintenance procedures and troubleshooting of their equipment. Provide an additional 48 hours of instructions over a 3-year period for but not limited to operate interface program, software programming, system diagnostics, hardware installation and

repair. No session to be more than 4 hours long with no limit on attendees. Technical support for 3 years over the phone shall be provided at no additional cost to the Owner. The Contractor shall be able to call and diagnose the system from his office.

PART 2 - MATERIALS AND METHODS

2.1 INSTALLATION

A. GENERAL

01 The Stand Alone Control Units (SCU) and other controls processing units shall be located in air handling unit rooms and other mechanical rooms. Do not remote locate units in RTU's, above ceilings or non-mechanical room spaces.

02 The mechanical contractor shall receive, handle, mount and install all automatic temperature control valve bodies and linkages. All automatic control valves shall be furnished by the controls manufacture.

03 All control dampers shall be furnished by the control manufacturer and installed by the sheet metal 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.

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.

2.2 EQUIPMENT

A. TEMPERATURE SENSORS

01 GENERAL: All sensors shall be thermistor type (10K at 77°F) with output over the scheduled temperature range.

02 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".

03 OUTDOOR AIR SENSORS: Waterproof with sunshield over sensing element. Sensing range shall be -30° to 130° F with an accuracy of ±1° F.

04 DUCT AIR SENSORS: Duct mounted junction box containing electronics and with 9" long sensing probe. Sensing range shall be 32° to 134° F with an accuracy of ±1/2° F.

05 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. 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.

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. Straight through valves 1" and smaller may be equal percentage characterized ball valves.

E. FLOW SWITCH: Vapor tight, packless construction with all wetted parts made of brass and designed for mounting in pipe tee. Paddle to have removable segments to accommodate required pipe size and flow. Switching action: single pole, double throw with a minimum rating of 7 amps at 120 volts. Mount switch in horizontal pipe.

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. 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.

H. VAV BOX CONTROLLER: Digital control package with integral damper operator for mounting in box controller housing. Controllers shall be sent to the approved box manufacturer for factory installation.

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.

J. HIGH STATIC LIMIT SWITCH: Switches shall be diaphragm operated with 3½" 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.

K. STATIC PRESSURE SENSOR: Provide a differential pressure transmitter with a 4-20 ma and 0-10VDC output.

a. Accuracy: ± 1% of range
b. Ranges: 5.0"
c. Operating temp range: 32°F to 125°F

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. Install across 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 set point 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 150 V 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. AIR FLOW MONITOR: Provide an AFM comprised of one or more insertion probes assemblies per duct location. The AFM shall feature microprocessor based electronics, low flow sensitivity, true averaging velocity and temperature compensated velocity output. The output signal shall be available in 0-5VDC or 4-20 mA. Provide multiple probes and an electronics panel to average the flow of 2 to 8 probes based on duct size. Sensor Accuracy = ± 2%, Operating Temperature Range –20 to 160 degrees Fahrenheit, Max Pressure Drop (delta P) = .005 in. WG @ 2,000 fpm in a 12 x 12 in. duct, Probe Material – Aluminum 6063 TS2.

R. MISCELLANEOUS: Provide and install all relays, switches, and all other necessary devices required for a complete and satisfactory operating system.

S. CENTRAL PLANT I/O DEVICE: In the central plant provide a touch screen device to allow maintenance personnel override control of central plant equipment including adjacent air cooled chillers and cooling towers. System shall maintain safety interlocking to prevent damage to equipment, i.e. operating chiller without associated pump.

T. SMOKE DETECTORS: Detectors provided by the fire alarm subcontractor. Controls subcontractor shall wire the starter control circuit through the smoke detector auxiliary contact.

U. LIGHTING:

01 EXTERIOR LIGHTING AND INTERIOR COMMON SPACES: Direct control by BAS through contactors. Contactors provided and installed by Division 26.

02 INTERIOR SMALL SPACES: Local controls only by Division 26.

03 Provide override and keyed occupancy switches.

a. Local keyed override switch.
(i) Provided and installed by Division 26. Wiring and programming by BAS Controls Contractor.

b. Lighting keyed occupancy switch.
(i) Provided and installed by Division 26. Wiring and programming by BAS Controls Contractor.

c. Multi-button lighting override switch.
(i) Rough in by Division 26. Switch provided, installed, wired, and programmed by BAS Controls Contractor.

04 Reference lighting drawings, details, schedules, and sequence of operations on electrical drawings for additional information.

V. SECURITY:

01 Security system by Division 28. BAS to monitor state for control of lighting.

02 Reference lighting details, schedules, and sequence of operations on electrical drawings.

W. FIRE ALARM:

01 Fire alarm system by Division 28. BAS to monitor state for control of lighting.

02 Reference lighting details, schedules, and sequence of operations on electrical drawings.

X. ELECTRIC METER: Provide power meter for monitoring main switchgear. Meter, Integration and programming by Division 25. Installed by Division 26.

01 Reference section 25 36 13 Integrated Automation Power Meters.

Y. BACNET INTERFACE:

01 Provide interface to all devices as noted in sequence of operation for monitoring and control.

2.3 BUILDING AUTOMATION SYSTEM (BAS)

A. GENERAL REQUIREMENTS:

01 CONTRACTOR RESPONSIBILITY: The BAS Contractor shall be fully responsibility for the complete installation and proper operation of the Building Automation System equipment, sensors and controls devices. 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. 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, set points, timing sequences or other software features to provide satisfactory operation as a part of his warranty package.

02 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.

03 SYSTEM INTERFACE: Operator interface to the control system shall be graphical accessed through the internet. Provide district wide site map with each school listed and shown. Individual school controls system shall be viewed by selecting that school. The various systems, settings and operating conditions shall be viewed/modified though the various controls screens for that school.

B. GRAPHIC CONSTRUCTION:

C. COLOR VALUE: Space temperature and its deviation from zone set point 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:

01 General area maps shall show locations of controlled buildings in relation to local landmarks.

02 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 set points. The colors shall be updated automatically without operator action. Set point adjustment and color band displays shall be operator definable. Floor plan maps shall also show the relative position of sensors and mechanical equipment. Each zone shall display the set point temperature and measured temperature.

03 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 set point and measured value.

04 All system graphics shall come programmed and require no owner modification. Individual graphics shall be as minimum the following:

a. Complete chilled water piping system
b. Complete hot water piping system
c. Each chiller
d. Each air handling unit
e. Each VAV and CVT box
f. Main switchboard meter

D. INFORMATION ACCESS: The following information shall be selectable from a menu available on various graphics:

01	Alarms	Schedule graphs
02	Message	Schedule groups
03	Module status	Set points
04	Programming parameters	Trends
05	Utilities	

06 Programming, scheduling and set point changes shall be accessible for modification of each menu for the associated equipment. Operator shall be able to automatically download changes to the appropriate program for the equipment being controlled. Operator shall be able to upload information from the field modules. In addition to having the ability to adjust set points on zones individually, the system shall allow the operator to make global set point changes that would take one command and automatically download it to the individual pieces of equipment and adjust their set points 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.

2.4 SPECIFIC GRAPHIC REQUIREMENTS

A. Data Format

01	Temperature:	Tenths	xx.x	ºF
02	Percentage:	Units	xx	%
03	Amps:	Units	xx	A
04	Humidity:	Units	xx	%
05	Air Quantity:	Units	xxxx	CFM
06	GPM:	Units	xxx	GPM

B. Main School Screen

01 Provide an overview of the entire building with color coding of zones based on temperature relative to set point, with light gray indicating zone is off. Green shall be area within set point tolerance, and varying shades of light to darker blue for lower than set point, and varying shades of light to dark red for higher than set

point.

02 Clicking on an area of the building will change to a more detailed graphic of that area.

03 Provide table listing outside air temperature and RH percentage, and status for Fire Alarm, Security Alarm, Emergency Generator and Air Conditioning Emergency Shutdown.

04 Provide button to click to go to equipment and mechanical systems graphics.

C. Detailed Area Graphics

01 Individual zones shall be color coded base on temperature relative to set point, with light gray indicating zone is off. Green shall be area within set point tolerance, and varying shades of light to darker blue for lower than set point, and varying shades of light to dark red for higher than set point.

02 Label zone by AHU, AHU and Zone or AHU and DD/VAV Box as applicable with zone temperature listed.

03 Clicking on zone shall transfer to applicable AHU or DD/VAV box.

04 Provide button for each AHU serving this area that transfers to the AHU graphic.

05 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is ON shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors, not condition of the enabling point.

D. Main Mechanical Room

01 Provide graphic showing mechanical room fans, unit heaters and purge systems.

02 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors, not condition of the enabling point.

03 Each data point shall be displayed adjacent to an appropriate graphical symbol located in the proper position in the system.

E. Main Equipment Graphic

01 Provide composite graphic for the chilled water/condenser water system at the central plant. The ON/OFF 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. Status shall be based on equipment status sensors, not condition of the enabling point.

02 Provide composite graphic for the heating water system at the central plant. The ON/OFF condition of each boiler and pump shall be a color coded element of the equipment: gray OFF, blue ON, red failed.

03 Provide buttons for each AHU and RTU that will transfer to the associated graphic.

04 Provide buttons for chilled water, condenser water and heating water systems that transfer to the associated graphic.

F. Chilled Water System Graphic

01 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.

02 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors, not condition of the enabling point.

03 Each data point shall be displayed adjacent to an appropriate graphical symbol located in the proper position in the system. Include enable, status, alarm, run amps and % loaded for each chiller.

G. Heating Water System

01 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.

02 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors, not condition of the enabling point.

03 Each data point shall be displayed adjacent to an appropriate graphical symbol located in the proper position in the system. Include enable, alarm and status of each piece of equipment.

H. Air Handling Unit, Rooftop Unit and Fan Coil Unit Graphic

01 Provide graphic that shows all coils, valves and dampers. Outside air and return air shall be shown.

02 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors, not condition of the enabling point.

03 Each data point shall be displayed adjacent to an appropriate graphical symbol located in the proper position on the graphic. Include enable, alarm and status of each piece of equipment.

I. VAV/CVT Box

01 Provide individual graphic for each box and equipment.

02 Provide graphic that shows all coils, valves and dampers.

03 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors, not condition of the enabling point.

04 Each data point shall be displayed adjacent to an appropriate graphical symbol located in the proper position on the graphic.

J. Fans and Unit Heaters

01 Equipment with local/room thermostat shall have graphic noting state of unit and associated space temperature.

02 Fans associated with a particular air handling unit shall be a part of the air handling unit graphic.

K. DX Mini-Split with Thermostat Interface

01 Provide graphic that shows unit status, commanded cooling/heating stage and

associated space temperature.

02 Each piece of equipment shall be labeled and have a text indication whether it is ON, OFF or FAILED. Additionally, equipment that is on shall have some graphical indication of its status, either by color or animation. Status shall be based on equipment status sensors (dry contact, CT on incoming power, etc), not condition of the enabling point.

L. Main Switchboard and Service Entrance Meters

01 Provide individual graphical display of all monitored information and include historical trend graph with a user selectable historical range.

a. Each monitored item's data curve may be toggled on/off by the user.
b. Provide unique colors for each monitored item.
c. The date range to display shall be user selectable over any period up to a minimum of thirty (30) days. The default range shall be seven (7) days.

2.5 STAND-ALONE CONTROL UNIT (SCU):

A. 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.

B. 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. Each module shall have an automatic restart feature with sequencing after power failure and shall not require reloading at power up.

C. COMMUNICATION: To share global building data, such as outside air temperature, humidity and electric demand, modules shall be able to communicate with each other over a local area network (LAN). 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.

2.6 SCU FUNCTION:

A. 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. 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.

B. 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.

C. 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.

D. EMS FUNCTIONS: Each SCU shall be capable of performing the following energy management routines as a minimum:

01 Chilled or Heating Water Reset

02 Chiller Sequencing and Optimization, Lead/Lag

03 Duty Cycling (Temperature compensated)

04 Event Initiated Programs

05 Graphic Trend Analysis

06 Maintenance Management

07 Peak Demand Limiting

08 Source Optimization

09 Start/Stop Time Optimization

10 Supply Air Reset

11 Time of Day Scheduling

12 The building operator shall be able to manually restore all system programs from the central site hard disk.

2.7 SEQUENCE OF OPERATION

A. Refer to Section 25 09 93.

2.8 SUBSTANTIAL COMPLETION

A. The mechanical systems will not be declared substantially complete until the automatic temperature controls for that portion has been demonstrated to be complete and functioning as intended. Operation in manual mode is not acceptable. 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

SECTION 25 95 10 BUILDING AUTOMATION SEQUENCES OF OPERATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Mechanical Requirements as specified in Sections 23, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 23 00 00.

1.2 RELATED WORK

A. Section 25 00 00 – General BAS Requirements

B. Section 25 00 10 – BAS Closeout Requirements

C. Section 25 36 13 – Integrated Automation Power Meters

D. Section 25 50 00 – Direct Digital Control System for HVAC

E. Section 26 00 00 – General Electrical Requirements

F. Section 26 05 00 – Common Work Results for Electrical

G. Section 26 09 43 – Network Lighting Controls

H. Section 26 24 00 – Switchboards and Panelboards

I. Section 26 29 00 – Low-Voltage Controllers

J. Section 26 32 13 – Packaged Generator Assemblies

K. Section 26 36 00 – Automatic Transfer Devices

L. Section 27 00 00 – General Technology Requirements

M. Section 27 10 00 – Communications Cabling General Requirements

N. Section 27 15 00 – Communications Horizontal Cabling

O. Section 28 13 00 – Security and Access Control System

P. Section 28 31 00 – Fire Detection and Alarm

PART 2 - SEQUENCE OF OPERATIONS

2.1 GENERAL REQUIREMENTS

A. The energy management system shall monitor the building conditions 24 hours per day.

B. Systems with thermostats that control both heating and cooling shall be programmed to

have an operator selectable dead band.

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. BAS shall be able to manually reset any alarm remotely to restart the chiller at the discretion of the operator, either by direct connection or through a BACNet interface.

D. Where air systems are designed to have economizer functions, provide an icon on the main building graphic that allows the operator to globally disable this function.

2.2 SYSTEM START/STOP

A. Each air handling unit or unitary equipment shall have an individual schedule of operation. If any equipment requires chilled water for cooling, chiller plant shall operate. If any equipment requires heating water for heating, heating water plant shall operate. System shall allow operator to selectively require more than one system to require cooling or heating for those systems to be energized.

01 AHU-B1 has a DX cooling coil for use in after-hours operation. The chiller plant shall not start if this unit calls for cooling.

B. When an air handling unit or other conditioning system is schedule on at a certain time, this means the space temperature setpoint is attained at that time. Unit shall be started prior to that time to initiate cool down or warm up period. This start time shall be calculated based on interior conditions, outside air temperature and historical data of the inertia of the building.

C. ERV's, exhaust fans, supply air fans and supply air dampers shall not be operating/open during the cool down/warm up cycle. If an associated air handling unit is manually started, these fans and dampers shall also operate.

D. The system shall be programmed with a purge mode that will continue to provide ventilation air the building after the scheduled occupancy is passed. The purge mode shall be user adjustable and shall be set to a default of 2 hours. During purge mode, all ERV's, exhaust fans and supply air fans shall remain active. Space temperatures shall be reset to their unoccupied setback setpoints.

2.3 CHILLED WATER SYSTEM, VARIABLE PRIMARY – DETAIL 1/M4.00

A. START UP: If one or more air handling units are on and requesting cooling, the chilled water plant shall be started:

01 The control valves on the lead chiller and shall be opened to 100%.

02 The lead chilled water pump is energized. Flow shall be verified based on differential pressure across the pump.

03 The pump shall ramp up to meet the chilled water system setpoint, as measured by a differential pressure sensor located within the chilled water system.

04 The BAS shall measure the return water flow rate at the pump(s) and modulate the chilled water bypass valve in the central plant to achieve 110% of the minimum chiller flow rate.

05 Once the chiller minimum flow rate is achieved, the lead chiller is enabled. The chiller starts up under its own control and maintains leaving water temperature setpoint as designated by the EMS.

B. PUMP CONTROL:

01 The BAS shall continuously monitor the differential pressure sensor located at

approximately 2/3 of the farthest distance from the central plant.

02 The lead chilled water pump shall modulate as required to maintain the differential pressure setpoint. The setpoint, determined during Test & Balance, shall be the differential pressure required to maintain full scheduled flow at all connected chilled water coils.

03 Whenever the lead chilled water pump is operating at 60hz and the DP setpoint is not met, the next chilled water pump shall be started and shall be modulated to maintain the DP setpoint.

04 Differential Pressure Setpoint Reset: The BAS shall monitor all the valve positions within the system. When every valve is open 90% or less, the BAS shall adjust the DP setpoint down by 1% every 10 minutes, or until one or more valves is 95% open. When any valve is open 100%, the BAS shall adjust the DP setpoint up by 1% every 10 minutes, or until all valves are open 95% or less.

C. CHILLED WATER BYPASS VALVE CONTROL

01 The BAS shall continuously monitor the chilled water return flow rate and chiller status.

02 The BAS shall modulate the bypass valve to maintain 110% of the chiller(s) minimum flow rate. The minimum flow rate shall be calculated based upon the number of chillers in operation and the manufacturer provided data for one chiller.

03 The bypass valve shall modulate at a flow rate of change of 10% per minute, maximum.

D. CHILLER STAGING CONTROL:

01 The lead chiller shall be run alone, using its internal controls to maintain the chilled water leaving temperature set point. When the chiller load reaches 95%, the BAS shall start the lag chiller startup sequence.

02 The BAS shall add the new staged chiller to the Bypass Valve Control Sequence minimum chiller flow rate setpoint. The BAS shall verify that the current system flow rate is greater than the total minimum flow rate for the lead chiller and lag chiller. If not, the Chiller Staging Sequence shall wait for the bypass valve to reach the new minimum flow setpoint.

03 The BAS shall modulate open the lag chiller control valve, maintaining a maximum flow rate of change of 10% per minute. Once the control valve is at 100% open, and flow across the chiller is proven, the lag chiller shall start.

04 When the chiller load reaches 35% (each), the BAS shall start the lag chiller shut down sequence.

05 Whenever a chiller is stopped, it shall ramp to zero capacity then stop. The chiller control valve shall modulate closed, maintaining a maximum flow rate of change of 10% per minute.

06 The Bypass Valve Control Sequence minimum total flow rate setpoint shall not be updated until after the lag chiller is stopped and the control valve is completely closed.

E. 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.

01 The controls contractor shall provide an external contactor to remotely engage the chillers physical alarm override switch. This shall be wired into the chillers

wiring harness at the connection to the physical switch.

02 The controls shall calculate the flow rate through each chiller based upon the measured differential pressure and corresponding flow data provided by the chiller manufacturer. The controls shall sum the total flow and compare to the measured flow in the common chilled water return line. If the flow differential is more than 10%, the controls shall set the alarm the user that the system flow rate is out of tolerance.

F. The EMS shall calculate building tonnage based on interrogating each chiller and summing loads. Calculation shall be smoothed by time averaging.

G. Note that TAB will set primary speed to obtain proper flow quantities. EMS shall use these settings to control pumps, not 60 Hz.

H. Chiller Manager Control Points:

01	Each CHW Pump	AO (RPM)
02	Pump Status	DI
03	CHW Pump Isolation Valve	DI (Position)
04	CHW By-Pass Valve	AI (% open)
05	Building CHW Supply	AI (Temperature)
06	Building CHW Return	AI (Temperature)
07	System Control Differential Pressure	AI (Pressure)
08	Chilled Water Flow Rate	AI (GPM)
09	Minimum Flow Rate of Change	AI (Percentage)

I. Each Chiller Control Points:

01	Chiller Energize	DO
02	Chiller Isolation Valve	AI (% Open)
03	Chilled Water Differential Pressure	AI (Pressure & Calculated GPM)
04	Chiller Supply Water Temp Setpoint	AO (Temperature)
05	Chiller Supply Water Temperature	AI (Temperature)
06	Chiller Operating Capacity	AI (Percentage/Tons)
07	Chiller Failure Status	DI (Alarm Point)
08	Chiller Alarm Reset	DI
09	CHS Temperature out of tolerance	Calculated Alarm Point
10	Chilled Water Pump Status	DI
11	Chiller Run Time	Calculated Report Point

J. Each Chiller BACnet Points

01	Chiller Alert & Alarm Readout	Read (Alarm/Alert Code)
02	Chiller Operating Capacity	Read (Tons)
03	Chiller Flow Switch	Read (Status)
04	Chiller EWT	Read (Temperature)
05	Chiller LWT	Read (Temperature)

	06	Chiller Suction Temp	Read (Temp, each circuit)
	07	Chiller Discharge Temp	Read (Temp, each circuit)
	08	Chiller Discharge Pressure	Read (Pressure, each circuit)
	09	Alarm Relay Status	Read (Status)
	10	Alert Relay Status	Read (Status)
	11	Machine Operating Hours	Read (Hours)
	12	Compressor Starts	Read (Start Number, each compressor)
	13	ALL OTHER AVAILABLE POINTS	Display in tabular form for read only.

K. Each Associated VFD BACnet Points

	01	ALL AVAILABLE POINTS	Display in tabular form for read only.

2.4 HEATING WATER SYSTEM, VARIABLE PRIMARY – DETAIL 2/M4.00

A. If any air handling unit is on and requesting heat, or three or more VAV boxes are on and requesting heat, lead hot water pump is energized and maintains system pressure. If pressure cannot be maintained, lag pump is started and operates at the same RPM to maintain setpoint pressure.

B. When the system pumps are de-energized, the associated boiler system shall also be de-energized.

C. Return water setpoint shall be 70°F if outside air temperature is above 70°F. Return water temperature setpoint shall be raised based on outside air temperature until it is 140°F at 27°F outside. Boilers have integral temp reset capability. Controls contractor shall coordinate with Mechanical contractor for programming of temp reset.

D. If outside air temperature is less than 30°F, the heating water system shall start.

E. The EMS shall constantly monitor alarm contact provided with the boiler.

F. Boiler Management Control Points:

	01	System Pump Run, Each	AO (RPM)
	02	Pump Status, Each	DI
	03	System Pressure	AI (Pressure)
	04	System Return Water Setpoint	AO (Temperature)
	05	System Supply Water	AI (Temperature)
	06	System Return Water	AI (Temperature)
	07	System Return Water out of tolerance	Calculated Alarm Point
	08	Boiler Capacity, Each	AI (% Fire)
	09	Boiler Alarm Failure Status	DI (Alarm Point)
	10	Run Time	Calculated Report Point

G. Boiler BacNet Control Points:

	01	Boiler Alert & Alarm Readout	Read (Alarm/Alert Code)
	02	Boiler EWT	Read (Temp, each boiler)
	03	Boiler LWT	Read (Temp, each boiler)

	04	Boiler Vent Temp	Read (Temp, each boiler)
	05	Boiler Modulate Rate	Read (% of full fire, each boiler)
	06	Boiler Ignition Status	Read (Status, each boiler)
	07	Boiler Circ Pump Status	Read (Status, each boiler)
	08	ALL OTHER AVAILABLE POINTS	Display in tabular form for read only.

H. Each Associated VFD BACnet Points

01	ALL AVAILABLE POINTS	Display in tabular form for read only.

2.5 VAV AIR HANDLING UNIT WITH TERMINAL BOXES – DETAILS 1,2/M4.01

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. Associated outside air damper or fan shall start/open to preset position based on occupancy schedule or override condition. Chilled water valve shall modulate to maintain 54°F leaving 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 spaces to above 65°F before starting enabling chilled water valve.

B. The control system shall modulate the fan to maintain a set duct pressure, as measured by a static pressure sensor located approximately 2/3 of the longest duct run from the AHU. The EMS shall monitor all the VAV box cold air damper positions and reset the static pressure setpoint, so that it is no higher than required to have one box at 95% open and all others less open. 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. For units served by an ERV, send a start signal to the associated ERV when the unit is scheduled to be on and ventilation is required.

F. For units with back-up DX cooling coils (AHU-9), the DDC controller shall modulate the associated DX condensing unit with 0-10V signal to maintain the cooling leaving air setpoint.

01 The DX coil shall only be operational when the chilled water plant is not scheduled to be on.

02 If the chiller plant starts up while the unit is in DX cooling mode, once the chilled water loop meets its temperature setpoint, the AHU controller shall deactivate the DX cooling and switch to chilled water cooling.

G. Fan status shall be based on differential pressure sensors.

H. Fire alarm system shall disable fan through VFD interlock when in alarm, and send alarm to the operator's workstation.

I. 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.

J. For all AHU equipped with UV lights, the BAS shall monitor and control the UV lighting

power status. The UV lights shall be interlocked to run with the AHU. The controls graphics shall show the UV light status.

K. Associated VAV boxes shall maintain zone set point temperatures by modulating cold air damper and sequencing on heating coil valve. Minimum setting of cold valve shall be adjustable with initial set point as indicated on the equipment schedule. CVT fans shall run constantly when box is enabled. Parallel terminal fans shall run only during heating.

L. AHU (VAV Unit) Control Points:

01	Fan VFD	AO (RPM)
02	Fan Status	DI
03	Chilled Water Valve	AO
04	Heating Water Valve	AO
05	Duct Static Pressure	AI (Pressure)
06	Supply Air Temperature	AI (Temperature)
07	Entering (Mixed) Air Temperature	AI (Temperature)
08	Smoke Detector/Firestat	ALARM POINT
09	Fan Status	DI
10	UV Light Status	DI
11	UV Light ON/OFF	DO
12	Supply Temperature out of tolerance	Calculated Alarm Point
13	Run Time	Calculated Report Point

M. Each VAV Terminal Control Points:

01	Unit Enable	DO
02	Zone Temperature	AI (Temperature)
03	Supply Air Temperature	AI (Temperature)
04	Primary Air Supply	AI (CFM)
05	Primary Air Damper	AO
06	Heating Coil Valve	AO
07	Maximum Primary Air Setpoint	Data Point
08	Minimum Primary Air Setpoint	Data Point

N. Each DX Condensing Unit (AHU-B1 Only)

01	Start/Stop	DO
02	Capacity	AO (0-10V)
03	Status	DI
04	Alarm	DI

O. Each Associated VFD BACnet Points

01	ALL AVAILABLE POINTS	Display in tabular form for read only.

P. Each Associated DX Condensing Unit BACnet Points (AHU-B1 Only)

01	ALL AVAILABLE POINTS	Display in tabular form for read only.

2.6 SINGLE ZONE FOUR PIPE UNITS WITH VFD DRIVE – DETAIL 3/M4.01

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 set point. Controller shall monitor space temperature and vary fan speed between maximum and minimum setpoints to maintain space temperature. Once minimum setpoint speed is reached, heating coil valve is opened to maintain space temperature. If heating valve is fully open and additional heating is required, increase fan speed.

B. For units with space humidity sensor/control, EMS shall incrementally open heating valve over time to maintain setpoint. If fan speed has reached 95% of maximum speed, heating valve shall be prevented from opening further.

C. For units with CO2 sensors, the associated ventilation air supply valve shall be modulated closed to maintain the CO2 setpoint. Once the ventilation air has reached its minimum setpoint, it shall be prevented from closing further.

D. For units with ventilation air preheat/precool coil (AHU-2B), the heating/cooling coil valve shall modulate to maintain 55°F leaving air temperature.

E. For units with back-up cooling (AHU-5 & GPH system), the DDC controller shall close the chilled water isolation valves, energize CHP-4 and the GHP system to provide chilled water to AHU-05.

01 The GHP system only be operational when the chilled water plant is not scheduled to be on.

02 If the chiller plant starts up while the unit is in GHP cooling mode, once the chilled water loop meets its temperature setpoint, the AHU controller shall deactivate the GHP system, de-energize CHP-4 and open the chilled water isolation valves to switch to the plant chilled water cooling.

F. Associated outside air fans/dampers shall be interlock with unit operation but operate only during occupied times, or during a ventilation purge sequence.

G. Fan status shall be based on differential pressure sensors.

H. Fire alarm system shall disable fan through starter interlock when in alarm.

I. Safety devices and circuits such as low limit thermostats, high limit thermostats and fire alarm contacts shall operate whether the starter is in Auto or Hand position.

J. For all AHU equipped with UV lights, the BAS shall monitor and control the UV lighting power status. The UV lights shall be interlocked to run with the AHU. The controls graphics shall show the UV light status.

K. Note that TAB will set fan speed with VFD to set maximum air quantities. EMS shall use these settings as maximum settings for variable air quantities.

L. AHU Controls Points:

01	Fan VFD	AO (RPM)
02	Fan Status	DI
03	Zone Temperature	AI (Temperature)
04	Zone Humidity	AI (Humidity)
05	Zone CO_2	AI (CO_2)
06	Chilled Water Coil Valve	AO
07	Heating Water Coil Valve	AO

08	Pre-Heat Coil Water Valve	AO
09	Pre-Cool Coil Water Valve	AO
10	ACCU	AO (Stages)
11	Supply Air Temperature	AI (Temperature)
12	Entering (Mixed) Air Temperature	AI (Temperature)
13	UV Light Status	DI
14	UV Light ON/OFF	DO
15	Smoke Detector/Firestat	ALARM POINT
16	Supply Temperature out of tolerance	Calculated Alarm Point
17	Run Time	Calculated Report Point

M. Each Associated VFD BACnet Points

01	ALL AVAILABLE POINTS	Display in tabular form for read only.

2.7 ENERGY RECOVERY UNIT – DETAILS 3,4/M4.00

A. Unit shall be controlled by field mounted DDC controller, and shall start operation based on a request for ventilation air from an associated AHU.

B. The control system shall modulate the fan to maintain a set duct pressure, as measured by a static pressure sensor located approximately 2/3 of the longest duct run from the ERV. (For ERV-C1, the unit shall control based on the supply plenum pressure). The EMS shall monitor all the ventilation air terminal box damper positions and reset the static pressure setpoint, so that it is no higher than required to have one box at 95% open and all others less open. 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. Exhaust Air Control: The control system shall calculate the total supply air, the sum of each ventilation air terminal box flow, and the total exhaust air, as measured by an airflow station. The exhaust fan shall be modulated to maintain a fixed offset from the supply air.

01 Exhaust Air = ERV Ventilation Air + Other Supply Fans – Other Exhaust Fans – Exhaust Air Offset

02 ERV-A1:

a. ERV Ventilation Air: Sum of air terminal boxes.
b. Other Supply Fans: None
c. Other Exhaust Fans: Ref. Schedule for CFM. All constant speed and start/stop with occupancy.

03 ERV-C1:

a. ERV Ventilation Air: As measured from the ERV supply fan flow rings.
b. Other Supply Fans: None
c. Other Exhaust Fans:
   (i) Ref. Schedule for CFM.
   (ii) KEF-1, KEF-2, KEF-3 on local switch. Monitor status and adjust exhaust air setpoint.
   (iii) Others constant speed and start/stop with occupancy.

D. Exhaust Air Offset Setpoint: The exhaust air offset setpoint shall be user adjustable.

01 ERV-1 – Exhaust Air Offset Setpoint – 1000 CFM

02 ERV-2 – Exhaust Air Offset Setpoint – 1000 CFM

E. Building Ventilation Air Purge Sequence: The ventilation air terminal box shall be set to 100% of its scheduled maximum CFM for a designated time period, Purge Time, after the building is no longer occupied. Leaving air setpoints for all AHU shall be maintained during the Purge Sequence.

01 Purge Time Setpoint: 2 Hours, Adjustable

F. For all ERV equipped with UV lights, the BAS shall monitor and control the UV lighting power status. The UV lights shall be interlocked to run with the AHU. The controls graphics shall show the UV light status.

G. Monitor filter alarms that are provided with the ERV's.

H. Unit Control Points:

01	Outside Air Fan	AO (RPM)
02	Outside Air Fan Status	DI
03	Outside Air	Calculated from Terminal Units (CFM)
04	Duct Static Pressure	AI (Pressure)
05	Exhaust Air Fan	AO (RPM)
06	Exhaust Fan Status	DI
07	Exhaust Air	AI (CFM)
08	Exhaust Air Offset	AO (CFM)
09	Exhaust Air Setpoint	AO (CFM)
10	Various Dampers	DO
11	Filter Alarm	DI
12	UV Light Status	DI
13	UV Light ON/OFF	DO

I. Each Ventilation Air Terminal Control Points:

01	Unit Enable	DO
02	Primary Air Supply	AI (CFM)
03	Primary Air Damper	AO
04	Maximum Primary Air Setpoint	Data Point
05	Minimum Primary Air Setpoint	Data Point

J. Each Associated VFD BACnet Points

01	ALL AVAILABLE POINTS	Display in tabular form for read only.

2.8 PACKAGED DX RTU

A. Unit shall be controlled by a factory installed, integral DDC controller with programming for Single Zone VAV operation. The BAS shall integrate into the DDC controller via BACnet for scheduling, monitoring and adjustment of setpoints. Hard wired control points for emergency start/stop and alarm shall be provided as listed below.

B. Cooling: The RTU shall modulate the fan speed & DX cooling circuit to maintain space temperature.

C. 2-Stage Gas Heat: The RTU shall stage the gas furnace heater to maintain space temperature.

D. Dehumidification: The RTU shall modulate the Hot Gas Reheat circuit to maintain the humidity setpoint.

E. Economizer: The RTU shall modulate the outdoor air economizer, based on comparative enthalpy control. The enthalpy baseline setpoint shall be adjustable.

F. Fan status shall be based on differential pressure sensors.

G. Fire alarm system shall disable fan through starter interlock when in alarm.

H. Safety devices and circuits such as low limit thermostats, high limit thermostats and fire alarm contacts shall operate whether the starter is in Auto or Hand position.

I. RTU Controls Points:

01	Occupancy	Schedule
02	Unit Start/Stop	DO
03	Unit Status	DI
04	BAS Space Temperature	AI (Temperature)
05	Alarm Status	DI
06	Smoke Detector/Firestat	ALARM POINT

J. RTU BACnet Points:

01	RTU Space Temperature Sensor	Read (Temp)
02	RTU Space %RH Sensor	Read (%RH)
03	Space Temperature Setpoint	Read/Write (Adjustable)
04	Space Humidity Setpoint	Read/Write (Adjustable)
05	Economizer Enthalpy Setpoint	Read/Write (Adjustable)
06	Unit Cooling	Read (Stages)
07	Unit Heating	Read (Stages)
08	Heater Status	DI
09	Supply Air Temperature	Read (Temperature)
10	Entering (Mixed) Air Temperature	Read (Temperature)
11	Cooling Coil LAT	Read (Temperature)
12	Outside Air Damper	Read (Position)
13	Filter Pressure Drop	Read (Pressure)
14	Smoke Detector/Firestat	ALARM POINT
15	Run Time	Read
16	ALL OTHER AVAILABLE POINTS	Display in tabular form for read only.

2.9 DX MINI SPLITS (for MC/IC Rooms)

A. Control of mini-split shall be by the factory provided mini-split thermostat interface, in lieu of a wired controller with integral thermostat. The interface shall take commands over hard-wired points from the BAS for start/stop, cooling stage 1/2 and heating stage 1/2.

B. A local thermostat shall be provided by the bas and shall have a digital read out and local setpoint control. The thermostat shall be setup natively with a local lockout for remote control of start/stop and setpoint through the BAS GUI only.

C. BAS shall send alarm if space is above 80°F.

D. Control Points:

01	Zone Temperature	AI (Temperature)
02	Start/Stop	DO
03	Cooling Stages	DO
04	Heating Stages (Heat Pump Only)	DO
05	Unit Status	DI (CT reading of ACCU power)
06	Zone Temperature Alarm	ALARM POINT

2.10 EXHAUST FANS AND OUTSIDE AIR DAMPERS

A. Outside air dampers/fans and exhaust fans are individually opened based on occupancy schedule and override condition.

B. Fans with local switch (kitchen fans & student range hood fans) shall operate only if switch is on and scheduled to be on. See wiring diagram on the drawings

C. Control Points:

01	Fan/Dampers	DO
02	Fan Status	DI

2.11 KITCHEN HOOD CONTROL SEQUENCE (KEF-1, 2 & 3)

A. The BAS shall monitor the status of all kitchen exhaust fans.

a. Each hood is provided with a constant volume exhaust fan that will operate at a fixed CFM. The BAS shall monitor the fan status of each exhaust fan.

b. The BAS shall keep a running total of the kitchen exhaust airflow rate by adding up the scheduled CFM of each active exhaust fan.

c. Coordinate with TAB to adjust to match final measured value.

02 Kitchen Hood Air Balance: The BAS shall keep an ongoing calculation of the current kitchen hood air balance.

a. Kitchen Hood Air Balance = Sum of all Exhaust CFM
b. Make-up Air CFM = AHU-D2 O/A – Kitchen Hood Air Balance

B. KITCHEN FAN Control Points:

01	Fan Enable, Each	DO
02	Fan Status, Each	DI
03	Kitchen Hood Air Balance	Calculated Point (CFM)
04	Make-Up Air CFM	Calculated Point (CFM)

2.12 BOILER ROOM VENTILATION

A. The ventilation system shall provide space cooling. BAS shall monitor space

temperature, open supply fan damer and start supply fan on temperature above set point.

B. Control Points

01	Fan/Dampers	DO
02	Zone Temperature	AI (Temperature)

2.13 DOMESTIC WATER HEATERS

A. Water heater circulation pumps shall be scheduled ON/OFF. EMS shall send signal to individually control the various water heater circulation pumps. Water heater circulation start time shall be 0.5 hours (adjustable) before scheduled occupancy.

B. Control Point:

01	Enable	DO
02	Scheduled Occupancy Start Offset	AI
03	Alarm Monitor (each heater)	DI

2.14 LIGHTING CONTROL

A. Provide BAS integration of each lighting relay panel listed on the electrical drawings.

01 Reference LIGHTING CONTROL SEQUENCE OF OPERATIONS, control schedules, wiring diagrams, and contactor schedules on sheet E6.01.

02 Each lighting control panel has a BACnet control interface. The BAS shall integrate all the available BACnet points for each lighting control panel and make the points available for scheduling within the BAS.

03 The BAS shall build schedules to switch lighting states in accordance with the Lighting Control Sequence of Operations and Lighting Control Zone Schedule listed on sheet E6.01.

B. Local Lighting Override Controls:

01 Provide labels on each switch identifying what is controlled and clearly indicate ON / OFF to match the switch operation.

02 Provide BAS control point to switch specified zones of lighting from a local keyed switch.

a. Local keyed override switches, where shown on the drawings.
   (i) Keyed override switches shall manually override the lighting schedule and engage all associated relays in the on position for the local building only. Control shall be ON only.
   (ii) This shall turn on all corridor lights and common space lighting.
   (iii) After hours shall be programmed by BAS to be maximum 2 hours per energy code.

b. Local toggle switches, where shown on the drawings.
   (i) Toggle switches shall manually override the lighting schedule and engage all contactors in the on position for the local lighting zone only.
   (ii) This shall turn on/off the associated lighting zone.
   (iii) After hours shall be programmed by BAS to be maximum 2 hours per energy code.

c. Lighting keyed occupancy switch, where shown on the drawings.
   (i) The permanent keyed occupancy switch shall be located in the

administration area. Reference the floor plans for location.

1. A temporary keyed occupancy switch shall be provided during phase 1 that shall be removed during phase 2.

(ii) Utilizes a full size core key switch matching the Owner's keyway.

(iii) Lighting keyed occupancy switch shall be a two position switch with the following settings:

1. ON: Sets all interior lighting circuits to the occupied setting.
2. OFF: Sets all interior lighting circuits to the unoccupied setting.
3. The exterior lighting schedule shall be unaffected by the lighting keyed occupancy switch position.
4. All other schedules that are not lighting schedules shall be unaffected by the lighting keyed occupancy switch position.
5. The intent is for a person with the proper keyed access to be able to set the lighting to occupied/unoccupied through the use of this switch.
6. The switch position shall not set a permanent hold and shall only be active until the next scheduled command from the BAS.
   a. For example, if the last person to leave sets the switch to off it shall set the interior lighting to the unoccupied state until the following day when the BAS schedule reasserts itself.

03 Provide BAS control point to switch specified zones of lighting from a local multi-button switch.

a. Local multi-button override switch, one (1) total.

(i) The multi-button switch shall be located in the main electrical room.

(ii) Multi-button override switch shall be set to control the lights by general type:

1. Interior lighting
2. Exterior building and canopy lighting
3. Exterior parking lot lighting

(iii) Interior lighting button shall manually override the lighting schedule and engage all interior lighting zone contactors in the on position for the whole campus.

1. This shall turn on all corridor lights and return local control to all other interior locations.

(iv) Exterior lighting buttons shall have on/off control and shall control all lights of each type for the whole campus.

C. Schedule exterior lighting zones via BACnet integration to the Lighting Relay Panel by zone through the BAS.

D. Schedule interior lighting zones via BACnet integration to the Lighting Relay Panel including on/off sweep through the BAS.

E. Fire Alarm Tie-In:

01 BAS to monitor fire alarm system state for control of lighting.

02 Reference lighting details, schedules, and sequence of operations on electrical drawings.

F. Security System Tie-In:

01 BAS to monitor security system state for control of lighting.

02 Reference lighting details, schedules, and sequence of operations on electrical drawings.

2.15 ELECTRICAL SERVICE MONITORING (MAIN SWITCHBOARD EXTERNAL METER)

A. Primary Metering

01 The monitoring system shall provide readouts for:

a. Current-per-phase
b. Phase-to-neutral voltage
c. Phase-to-phase voltage
d. Neutral-to-ground voltage
e. Phase frequency
f. KVA/KW instantaneous load
g. KVAh/KWh usage over 1-day, 7-days, 30-days, and 1-year.
h. Maximum KVA/KW instantaneous load over the previous 18 months.
i. Power Factor (PF)
j. Total Harmonic Distortion (THD)

02 The monitoring system shall have waveform capture and data logging capabilities including:

a. Harmonics
b. Unbalance
c. Flicker
d. Swell
e. Dip
f. Interruption

B. System shall store historical information of these values for the past thirty days.

C. The monitoring system shall be integrated into the building energy management system and shall provide all of the above monitoring and readout features directly through the building energy management system including waveform capture and historical logging.

2.16 ELECTRICAL POWER USAGE MONITORING FOR ENERGY CODE COMPLIANCE

A. Electrical power meters shall be integrated into the switchboard, provided and installed by Div. 26, and grouped into multiple energy use catagories. The controls contractor shall integrate the meters into BAS and provide continuous monitoring and storage of the metered data.

B. All meter outputs communicate through Modbus. The BAS shall integrate the Modbus connections for each meter tie-in and translate the Modbus data to tabular view within the BAS GUI.

C. Energy Use Catagories, each individually monitored by the BAS

01	HVAC	3 Meters
02	Interior Lighting	1 Meter
03	Exterior Lighting	1 Meter
04	Plug Loads	1 Meter
05	Process Loads: Commercial Kitchen	1 Meter
06	Building Ops., Vertical Trans. Sys.: Elevator	1 Meter

D. Modbus Metering Points for each Meter Category

01	Amperage, Per Phase	Instantaneous, stored for rolling 5 day window
02	Voltage, Per Phase	Instantaneous, stored for rolling 5 day window
03	KVA	Instantaneous, stored for rolling 5 day window
04	kWh	Cumulative, with daily totals archived

2.17 MISCELLANEOUS

A. CONTROL POINTS

01	Outdoor Air	AI (Temperature)
02	Kitchen Walk-in Cooler	AI (Temperature)
03	Kitchen Walk-in Freezer	AI (Temperature)
04	Emergency Generator Transfer Switch #1	
	a. Run Status	DI
	b. Source Power	DI
	c. Source Availability	DI
	d. Load Position	DI

2.18 LOCAL OVERRIDE CONTROL

A. Provide one override key switched for off hour equipment operation. One or more AHU's and associated fans and dampers may be assigned to a key switch. Each time the momentary key switch is turned, the assigned equipment will be on for one hour, up to a maximum of four hours. Individual equipment may be assigned to more than one switch. Group switches together on one stainless steel plate with descriptive nameplate under each switch. All switches shall be keyed alike.

B. The keyed switch shall be located in the Administration area on the back wall of the reception desk. Final location to be verified with owner prior to installation.

2.19 EMERGENCY SHUTDOWN

A. Provide an emergency shutdown switch 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 with a key operated switch located adjacent to the shutdown switch.

01 The keyed switch shall be located adjacent to the Local Override Control keyed switch.

B. In the event that the main electrical service loses a phase, controls system shall command all three phase motors and equipment to turn off. (Only motors controlled by the EMS).

2.20 INITIAL SYSTEM SET POINTS

Room Temperature	72° F
Chilled Water Temperature	44° F
Heating Water Temperature	Reset Schedule
VAV Air Unit Leaving Air Temperature	53° F
Single Zone Face & Bypass Cooling Coil Leaving Air Temperature	53° F

Humidity Sensors	55%
Duct Pressure Control Level	1.5” wg
Duct Pressure Safety Limit	3.5” wg
CO_2 Senor	1000 ppm
Building Pressurization Exhaust Offset	1000 CFM

END OF SECTION

SECTION 26 00 00 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

1.2 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.

1.3 DRAWINGS AND SPECIFICATIONS

A. GENERAL: Drawings and Specifications are intended to be complimentary. Any work described in either of them, will be work required under this contract. Where there is a conflict in the Drawings and Specifications it shall be clarified by RFI. Barring clarification prior to bidding the most expensive option shall be included and clarification shall be made during construction. 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. EQUIPMENT AND DEVICE LOCATION: 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. Refer to Architectural Drawings that may locate devices relative to casework or devices provided by other contractors. The drawings are schematic in nature and are not intended to show exact locations of conduit, but rather to indicate distribution, circuitry and control.

C. CEILING DEVICES: All light fixtures, speakers and other ceiling devices shall be located to conform to the ceiling grid system as shown on the Architect's reflected ceiling plan. Examine all drawings to become familiar with this requirement. In no case should fixture locations be determined by scaling drawings. Lighting fixtures in mechanical spaces are shown in their approximate location only. Do not install light fixtures until mechanical piping and ductwork is installed. At that time install lights in a location to provide best lighting.

D. MINOR RELOCATION: In certain instances, the Architect may require minor relocation of outlets, switches, etc. of up to five (5) feet. If Contractor is informed of necessary relocation before work is begun on this portion of the job, no extra compensation will be allowed.

1.4 REQUIREMENTS FOR ALL MATERIALS

A. U. L. LABEL: 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.

B. MISCELLANEOUS ACCESSORIES: Provide all parts and accessories necessary for a complete installation for the systems and equipment specified.

C. HAZARDOUS MATERIAL: All materials shall be certified to not contain any asbestos, PCB's or other material banned by the Environmental Protection Agency.

1.5 INSTALLATION REQUIREMENTS

A. COORDINATION: 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 to coordinate his work with the total project. 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.

B. BASIS OF DESIGN: Equipment that is scheduled is the basis of the design and has been coordinated for space, installation and electrical requirements. Equipment and models from other acceptable manufacturers have not been verified or coordinated and may vary from scheduled equipment. Contractor shall verify these requirements prior to using other equipment in his bid and include any additional costs for installation of the substitute equipment. Confirm electrical installation requirements of equipment provided by other trades prior to installation. Incorrectly installed materials shall be replaced at no cost to the Owner.

C. WORKMANSHIP: 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.

D. EQUIPMENT PROTECTION: Do not deliver equipment to jobsite until it is actually needed for installation. Protect equipment from damage due to construction activities and the weather. Equipment allowed to stand in weather will be rejected and Contractor is obligated to furnish new equipment at no cost to Owner.

1.6 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.

1.7 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.

1.8 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.

1.9 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. SERVICE: The service characteristics are 480Y/277V, 3 phase, 4 wire. The Power Company is CenterPoint Energy.

C. SERVICE ENTRANCE: Provide pad for pad mounted transformer, cable tap box, protective bollards or other special construction as required by the Power Company. Refer to Power Company standards.

D. FEES: Refer to Architectural Sections for requirements.

1.10 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 the latest NEC and OSHA Standards and the current edition of the National Electrical Safety Code (NFPA 70e) for safety in the workplace. Remove all temporary wiring upon project completion.

B. Pay all fees, charges, and installation costs charged by the Power Company for temporary service for construction power and its removal.

C. Where the Owner allows the use of the building permanent service for construction activities the contractor shall pay all fees, kilowatt hour charges, etc. related to its use.

1.11 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. . All extended warranties shall be from the date of acceptance by the Owner regardless of when the equipment was delivered to the job site or started up by the contractor.

1.12 SUBMITTALS

A. All submittals shall be submitted in PDF form. Submittal will be reviewed with comments incorporated in this PDF. After final approval, Contractor shall provide a hard copy for use at the project site.

B. 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. Shop drawings shall be approved before installation of the material under consideration.

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.

C. Equipment and material submittals must show sufficient data to indicate complete compliance with contract documents as follows:

01 Proper sizes and capacities.

02 That the item will fit in the available space in a manner that will allow proper service.

03 Floor plans, elevations, wiring diagrams, etc. necessary to verify proposed installation.

D. 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.

E. All submittals shall include a table of contents listing all items in that specific submittal. All submittals on the project need not be submitted in PDF. The front sheet of each copy of the submittal shall have the following typed information:

01 Job name and location.

02 General Contractor's name, address, project manager's name and telephone number.

03 Submitting Sub-contractor's name, address, project manager's name and telephone number.

04 Supplier's company name, address, salesman's name and telephone number.

F. 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.

G. Submit shop product data, wiring diagrams, shop drawings, and/or brochures and additional information as indicated below and in individual specification sections.

01 General Electrical
- a. Service Entrance Construction
- b. ¼" Scale Shop Drawings
- c. Electrical Coordination Study

02 Common Work Results
- a. Conduit
- b. Sleeves
- c. Wiring
- d. Pull Boxes
- e. Outlet Boxes
- f. Cable Tray

03 Grounding and Bonding
- a. Product Data
- b. Grounding Backbone Routing

04 Lighting Controls
- a. Product Data
- b. Shop Drawings
- c. Sequence of Operation

05 Electrical Equipment
- a. Switchboards
- b. Panelboards

c. Transformers
d. Circuit Breakers

06 Wiring Devices

07 Low Voltage Circuit Protective Devices
a. Disconnects
b. Enclosed Circuit Breakers
c. Fuses
d. Elevator Disconnecting Means

08 Low Voltage Controllers
a. Phase Loss Monitors
b. Contactors
c. Time Clocks
d. Photocells
e. Timers

09 Generator
a. Available Fault Current

10 Transfer Switches
a. Manual Transfer Switches
b. Automatic Transfer Switches

11 Surge Protective Devices

12 Lighting

13 Theatrical Systems
a. Theatrical Lighting
b. Theatrical Controls

H. Major equipment in AHU/Mechanical/Electrical Rooms will not be approved until contractor has submitted and received approved 1/4" scale coordination drawings of mechanical and air handling unit rooms showing sizes of proposed equipment, including access space, and mechanical and plumbing equipment also located in the room.

I. 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. SEG 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 SEG at a rate of $125/hr for these occurrences.

1.13 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 and are intended to be the Basis of Bid. 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 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 and this Article. If a submittal contains sufficient information to prove compliance with the Contract Documents, then that submittal will be acceptable.

01 ALTERNATE LIGHT FIXTURES: 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 these documents.

B. All other brands, including any additional names which may be listed as “Alternates” or “Approved Equal” must conform with the specifications, size, accessories, etc. of the first named brand and be subject to Paragraph D and E of this Article. Alternate equipment 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 Paragraph D and E of this Article.

01 Submitted on Bidder’s letterhead attached to Proposal Form with individual deductive amounts stipulated and the documentation required in Paragraph E-03.

02 All savings for Owners selection of deductive amounts by acceptance of alternate or substituted items are to be paid to the Owner.

C. All equipment within common group or category (e.g. switchgear, lighting fixtures, fire alarm, etc.) shall be same manufacturer.

D. Proposed Substitutions/Approved Equals:

01 Submitted no less than 14 calendar days prior to bid date.

02 Submit proposed substitutions with catalog data and/or manufacturer’s shop details indicating all modifications required to conform with specified brand. Include all relevant items necessary to make a determination of equal status or submittal shall be deemed incomplete and rejected.

03 If submittal contains sufficient information to prove compliance with the Contract Documents, then that alternate submittal will be acceptable. Approved submittals for bidding purposes only will be published by addenda.

E. Substitutions with prior approval:

01 Submitted on Bidder’s letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in Paragraph B-2.

02 Owner reserves the right to accept or reject any or all substitution proposals before execution of Contract.

03 Provide all design/engineering services required to make adjustments in space, systems, utilities, etc. and pay all additional costs of utilities, construction or professional services that may be incurred due to the acceptance of any substitution.

1.14 FOUNDATIONS AND EQUIPMENT SUPPORTS

A. GENERAL: Provide all foundations and supports.

B. CONCRETE PADS: All equipment mounted on the floor or outside at grade, including switchboards, transformers, inverters, generators, battery cabinets, and similar equipment and similar equipment, shall have a concrete housekeeping pad using a 3000psi mixture. Concrete pads shall be sized for the equipment to be supplied. Pad shall exceed base dimensions by approximately 4" all around. Reinforce pads with 6" x 6" woven wire mesh or #4 rebar. Provide #4 rebar around perimeter. Tool pad to form chamfered edge. Nominal pad thickness shall be 4” indoors and 6” outdoors. Increase pad height as needed to meet code requirements. Coordinate sizes and locations with the General Contractor. Refer to details for outdoor equipment.

C. OUTDOOR ELECTRICAL EQUIPMENT: Provide structural pad to support pad mounted

transformers, outdoor switchgear, generators and similar equipment provided by Division 26. 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.

1.15 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.

1.16 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. Testing shall be in accordance with generally accepted practice.

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. INFRARED SCANNING: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard, panelboard, switchgear, transformer, automatic transfer switch, and splices in cables/conductors No. 3 AWG or larger added, modified, or serving the area of work. Remove box and equipment covers so equipment interiors and splices are accessible to the portable scanner.

01 Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard and splice in cables/conductors No. 3 AWG or larger between six (6) and eleven (11) months after date of Substantial Completion or one (1) month before the end of the warranty period whichever is sooner.

02 Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values and produce a thermal image of the tested location. Provide calibration record for device.

03 Corrective Action: Use infrared scanning results to identify areas with high/abnormal temperature levels. Correct any deficiencies found and confirm

with a follow up infrared scan.

04 Record of Infrared Scanning: Prepare a certified report that identifies locations/equipment checked and that describes scanning results. Include images generated by thermal scanner, notation of deficiencies detected, remedial action taken, and observations after remedial action.

E. GROUND PENETRATING RADAR: Where concrete flooring or paving must be cut to install MEP systems, contractor shall take measures to prevent damaging existing underground services. Contractor shall utilize ground penetrating radar and electrical circuit tracing equipment in the area to be excavated to determine the existence of underground services. When saw cutting, limit the depth of the cut to less than the thickness of the concrete. Breakout the concrete manually with special care in areas of possible underground services.

F. ADDITIONAL TESTING: The Contractor shall make such other tests as required by the Authority Having Jurisdiction (AHJ) or as may be or become necessary to assure satisfactory operation of each unit device or equipment.

1.17 CLOSEOUT REQUIREMENTS

A. AS-BUILT DRAWINGS: 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.

B. OWNER'S INSTRUCTIONS: Provide the following periods of instruction for each site to the Owner's designated personnel upon completion of the system's installation. Provide additional training as noted in individual equipment specifications.

01 Reference 260010 Closeout Requirements.

C. CLOSEOUT MANUALS:

01 Reference 260010 Closeout Requirements.

1.18 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. Where a height is not listed below, refer to the architectural drawings. Where no heights are given, submit RFI prior to rough-in.

B. DEVICE:

Light switch	46"
Lighting Touchscreen	48" to the top
Receptacle	18"
Receptacle at counter	7" above countertop or horizontally in backsplash
	Coordinate with architectural drawings, do not mount in tackboards, markerboards, etc.
Receptacles in kitchens	Per the Food Service drawings.
	Where additional devices are shown on the electrical drawings without a specified height clarify per RFI.

Data outlet	18”
Data outlet at counter	7" above countertop
	Coordinate with architectural drawings, do not mount in tackboards, markerboards, etc.
Telephone outlet	18"
Telephone outlet at counter	7" above countertop
	Coordinate with architectural drawings, do not mount in tackboards, markerboards, etc.
Wall telephone	46" (or as shown on the Arch/Tech Drawings)
Wall mounted AP	Confirm with Owner
DMX Outlet	18”
A/V Plates	18”
Wall TV input	18”
A/V Display Boxes	Confirm with Owner
Microphone input plate	18”
Stage monitor outlets	18”
Volume Control	46”
Wall Clock outlet	12" below ceiling or 96" maximum
Indoor wall sound speaker	12” below ceiling or 96” maximum
Outdoor bells or speakers	10’-0” (or as shown on the Architectural Drawings)
Wall exit light	Bottom 4" above door frame or 96"
Wall pack light	14’-0” (or as shown on the Architectural Drawings)
Security Keypad	52”AFF, 16” off door frames
Card Reader	46”
Video Intercom Wall Station	46”
Wall Mounted Motion Sensors	Confirm with Owner
Wall Mounted Cameras	Confirm with Owner
Fire Alarm Control Panel	Confirm with Owner
Fire alarm pull station	46"
Fire alarm notification device	82" or on ceiling
Remote Annunciator	Confirm with Owner
Employee Time Clock	Confirm with Owner

1.19 ELECTRICAL INSPECTIONS

A. GENERAL: Contractor shall request inspections to review any and 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. GOVERNMENTAL INSPECTIONS: Contractor shall test and demonstrate systems,

allow for Engineer 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.

C. Contractor shall provide a MINIMUM of 48 hour notice prior to requested inspection time, no exceptions.

D. INSPECTION REPORTS: After each inspection, SEG 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 SEG via e-mail. After the signed-off report is returned to SEG, the GENERAL CONTRACTOR shall request a re-inspection by SEG to close the report. If after 7 working days no re-inspection is requested by the GENERAL CONTRACTOR to close a report, SEG 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 SEG 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. SEG shall be reimbursed $1000 by the GENERAL CONTRACTOR for expenses in connection with EACH inspection in addition to the two (2) re-inspections allowed.

1.20 COMMISSIONING AND TEST AND BALANCE

A. Third party commissioning and an independent test and balance contractor are a part of this project. Commissioning agent and T&B contractor will be under a separate contract directly with the Owner. Refer to included specifications for commissioning and T&B.

B. Electrical contractor shall complete the pre-function checklist for the various electrical devices. Checklists will be supplied by the commissioning agent.

C. Electrical contractor shall perform system tests as required by the commissioning agent in addition to any that are described in these specifications.

1.21 DEMOLITION AND REMODELING

A. In areas of demolition, contractor shall remove all electrical devices, conduit and wiring not to be reused. Any material that has salvage value shall be offered to the Owner, and if accepted, delivered to his warehouse or other designated location. If not accepted it shall be properly disposed of with the other construction debris.

B. Resupport, rehang, and rebundle existing conduit and cabling to remain. Rework existing circuits and installation to accommodate for renovation/demolition work including but not limited to changes in ceiling heights, ceiling types, and wall locations. Group cabling by type/trade and all materials shall be properly supported per applicable codes and standards.

C. Where partial circuits or systems are to be reused, ensure that they remain active. Where existing equipment is removed and reinstalled or replaced with new equipment, modify, extend and relocate existing feeder and other wiring, and connect to equipment. Relocate conduit as necessary to allow new or modified construction. Repair existing electrical systems damaged by construction activities.

D. Remove and replace ceilings as necessary to install or modify electrical systems.

E. Where ceilings are removed or replaced, remove and reinstall lights, speakers, security devices, fire alarm devices and other existing electrical and low voltage devices in the ceiling. Any low voltage cabling laying on ceilings shall be supported from structure per applicable codes and standards. Segregate fire alarm and security from other cabling.

F. Where existing adjustable circuit breakers are to be reused, adjust for revised loads. Where existing fused switches are to be reused, replace fuses with proper size for revised loads. Where new circuit breakers are to be installed in existing panels, verify that the circuit breaker will fit in the allotted space. Provide NEMA 1 enclosure installed adjacent to panel and wire connect to bussing if there is insufficient space.

G. Where light fixtures are to be replaced or added in existing areas, verify and coordinate existing voltages with fixtures to be supplied prior to ordering fixtures.

H. Where auxiliary systems such as fire alarm, security, data, sound, etc, interface with existing equipment that is replaced or modified (mechanical, electrical or plumbing), disconnect and reconnect these systems.

END OF SECTION 26 00 00

SECTION 26 00 10 - ELECTRICAL SYSTEMS CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

PART 2 - MATERIALS AND METHODS

2.1 CLOSEOUT REQUIREMENTS

A. AS-BUILT DRAWINGS: 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.

B. CLOSEOUT MANUALS: At completion of job, furnish three copies of spare parts lists, operating instructions, product cutsheets, test results, manufacturer's studies/settings/reports and as-builts for all equipment furnished under this Division. These lists and instructions shall be published by the manufacturer of the equipment. Bind in 3-ring binders with project name. Provide a USB flash drive with a digital copy of complete closeout manual with each binder.

01 DOCUMENTATION:

a. Lighting Controls
   (i) Complete device and equipment documentation.
   (ii) As-built drawings indicating device layout, wiring, and sequence of operations.
   (iii) As-built relay panel drawings/schedules indicating lighting zones.
   (iv) Owner operation memo generated for end user training.
   (v) Warranty information.

b. Switchboards, panelboards, low voltage circuit protective devices, and transformers.
   (i) Complete device and equipment documentation.
   (ii) User manuals on any meters, surge protectors, or other specialty devices.
   (iii) As-built panelboard drawings/schedules.
   (iv) As-build feeder routing and sizing.
   (v) Electrical systems coordination study, including letter from manufacturer or installer certifying breaker settings have been programmed per the coordination study results.
   (vi) Electrical systems ground testing report.
   (vii) Insulation testing report.
   (viii) Infrared scanning report.
   (ix) Warranty information.

c. Wiring Devices

(i) Complete device and equipment documentation.

d. Low Voltage Circuit Protective Devices
(i) Complete device and equipment documentation.

e. Low Voltage Controllers
(i) Complete device and equipment documentation.

f. Packaged Generator, Automatic Transfer Switches, and Manual Transfer Switches
(i) Complete device and equipment documentation.
(ii) User manuals.
(iii) Test data.
(iv) Device settings and any associated studies.
(v) Generator load bank test report
(vi) Warranty information.

g. Surge Protective Devices
(i) Complete device and equipment documentation.
(ii) Warranty information.

h. Lighting
(i) Complete device and equipment documentation.
(ii) Warranty information.

i. Theatrical Lighting and Rigging
(i) Complete device and equipment documentation.
(ii) User manuals.
(iii) As-built drawings indicating device layout, wiring, and sequence of operations.
(iv) Warranty information.

j. Division 27:
(i) Refer to Division 27 sections.

k. Division 28:
(i) Refer to Division 28 sections.

02 TRAINING SESSIONS:

a. Provide digital copy of each recorded training session with digital turnover documents.

03 TESTING:

a. 260000 – Building insulation testing report
b. 260000 – Building ground testing report
c. 260000 – Network grounding backbone testing report
d. 260000 – Building infrared scanning report
e. 263213 – Generator load bank test report

04 SPARE PARTS:

a. Deliver all spare parts and loose items to the Owner at the end of the project. Provide a spare parts list and signed transmittal listing all items with closeout documentation.

05 WARRANTY:

a. Provide manufacturer’s warranty information, including any extended warranties included in the project.
b. Provide warranty letter from each contractor and sub-contractor.

c. Provide copy of extended service contracts, if any, included in the project.

2.2 GUARANTEES, WARRANTIES, AND SERVICE CONTRACTS

A. GENERAL FOR ELECTRICAL SYSTEMS: 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.

B. NETWORK LIGHTING CONTROLS:

01 System warranty shall be for one (1) 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.

02 Provide a five (5) year complete manufacturer's warranty on all products to be free of manufacturers' defects.

C. PACKAGED GENERATOR:

01 Provide five (5) year or 1500 hour operation, non-prorated, parts and labor warranty for the generator.

02 Provide one (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 Owner's personnel for day and time.

D. AUTOMATIC TRANSFER SWITCHES

01 Provide five (5) year, non-prorated, parts and labor warranty for the transfer switch system.

E. MANUAL TRANSFER SWITCHES

01 Provide one (1) year, non-prorated, parts and labor warranty for the transfer switch system.

F. SURGE PROTECTIVE DEVICES

01 Ten (10) year, non-prorated, full replacement.

G. LIGHT FIXTURES:

01 Five (5) year warranty on LED boards, drivers, and components.

H. THEATRICAL LIGHTING

01 The equipment manufacturer shall provide a two (2) year warranty on the entire lighting system from date of acceptance.

02 The equipment manufacturer shall provide an eight (8) year warranty on the dimmer rack and modules, excluding control electronics.

I. DIVISION 27:

01 Refer to Division 27 sections for additional information.

J. DIVISION 28:

01 Refer to Division 28 sections for additional information.

2.3 SPARE PARTS

A. GENERAL: 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. Include a spare parts list and signed transmittal with closeout documents.

B. Reference individual specification sections for additional information.

C. NETWORK LIGHTING CONTROLS

01	Non-Dimming Room Controllers	Five (5) of each type
02	Dimming Room Controllers	Five (5) of each type
03	Occupancy Sensors	Five (5) of each type
04	Low Voltage Switches	Five (5) of each type
05	Daylight Harvesting Photocells	Five (5)
06	Handheld Controller	Two (2)
07	Handheld Configuration/Programming Tool	Two (2)
08	Emergency Bypass Controllers	Five (5)

D. FUSES:

01 Provide 10% spare fuses of each size, minimum of three (3) per size.

02 Provide cabinet sized to hold spare fuses. Install cabinet in main electrical room with engraved label reading “SPARE FUSE CABINET” on cabinet front and a laminated list of fuse sizes and part numbers inside. Bussman SFC-FUSE-CAB, Littelfuse LSFC, or approved equal.

E. LIGHT FIXTURES:

01	Exit Signs to be installed as single or double sided	Five (5)

F. DIVISION 27:

01 Refer to Division 27 sections for additional information.

G. DIVISION 28:

01 Refer to Division 28 sections for additional information.

2.4 TRAINING

A. Schedule the instruction in coordination with the Owner’s Representative after submission and approval of formal training plans and closeout documentation.

B. VIDEO RECORDING: All training sessions for specific systems equipment (Generator/ATS, Network Lighting Controls, etc.) shall be recorded and the recordings shall be included in the closeout materials.

C. GENERAL: Base electrical systems eight (8) hours.

01 Provide training/demonstration with handouts/documentation of the systems to be covered. Material covered shall include:

a. Maintenance of equipment.
b. Locations of equipment.
c. Locations of in-ground junction boxes.
d. Underground conduit.
e. EM lighting inverters.

f. Specialized or unique equipment.
g. Network grounding backbone.

D. NETWORK LIGHTING CONTROLS:

01 Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and daylighting controls.

02 6 Hours (2 hours on site for staff and 4 hours for maintenance personnel)

E. GENERATOR & STANDBY POWER SYSTEMS:

01 8 Hours (2 hours to general staff and 6 hours to maintenance personnel)

02 Set exerciser schedule as directed by Owner's representative.

F. THEATRICAL LIGHTING

01 8 Hours (Two 2-hour sessions to on-site staff and 4 hours to maintenance personnel)

02 Within 6 months, if requested by owner, contractor shall schedule a return visit to make adjustments to the programming of the system and give follow-up training of equipment, if needed.

03 During the warranty period, the manufacturer shall provide a toll-free 24-hour-per-day number for telephone technical support and service request.

G. DIVISION 27:

01 Refer to Division 27 sections for additional information.

H. DIVISION 28:

01 Refer to Division 28 sections for additional information.

2.5 SCHEDULED WARRANTY ITEMS

A. After 10 months but no more than 11 months from Owner acceptance the contractor shall perform:

01 A warranty walk with the Owner, Owner's Representative, Architect, and Engineer and correct any identified items.

B. Perform an Infrared scan of the electrical systems as indicated in 260000 General Electrical Requirements, generate a report to be reviewed by the Engineer, and correct any identified items.

C. NETWORK LIGHTING CONTROLS:

01 After 90 days from occupancy the factory authorized representative and electrical contractor shall re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect/Owner of all re-commissioning activity and changes.

END OF SECTION 26 00 10

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 RELATED WORK

A. Section 26 05 26 – Grounding and Bonding for Electrical Systems

B. Section 27 10 00 – Communications Cabling General Requirements

C. Section 27 10 05 – Grounding and Bonding for Technology Systems

D. Section 28 10 00 – Physical Security General Requirements

E. Section 28 13 00 – Electronic Access Control Systems

F. Section 28 16 00 – Video Surveillance Systems

G. Section 28 31 00 – Fire Detection and Alarm Systems

1.3 GENERAL INSTALLATION REQUIREMENTS

A. All electrical work dealing with electrical circuits or power requirements of 110 volts or higher shall be performed by a licensed journeyman electrician supervised by the designated master electrician of record.

01 A licensed electrical contractor and its designated master electrician of record is responsible for supervision of all licensees performing work on behalf of the contractor to assure compliance with applicable statutes and rules and in particular, standards of conduct set out in the Texas state Electrician Administrative Rules.

02 It may be necessary for the designated master electrician of record to be present on-site as required the Authority Having Jurisdiction, Owner, Architect, Engineer, or construction issues that may arise and shall be done at no additional cost to the Owner.

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 miscellaneous plenum rated cables shall be supported from and near structure with nylon straps or D-rings. Refer to individual specification sections for additional requirements. Do not weave through joists for support. All exposed cabling, and cabling above inaccessible ceilings shall be installed in raceway.

F. Install conduit sleeves with protective grommets for all wall penetrations for plenum rated cables.

G. Seal all sleeve and conduit penetrations of walls with grout or hardening caulk, suitable for wall material, to mechanically attach sleeves to the wall. Provide fire rated sealant at fire rated walls.

H. In areas of remodeling, remove all conduit and wire that is not to be reused. Resupport existing conduit and wire to remain.

I. Provide grounding bushings for all connections at concentric and eccentric knockouts, and where reducing washers are used.

J. All junction boxes and other devices above ceiling that may require maintenance shall be located within 18” of the ceiling.

K. Where light fixture switches are shown together, they shall be installed in a common junction box and faceplate.

L. Where receptacles and/or data outlets are shown grouped, install close together. Provide Caddy TSGB16, RBS16 or equal mounting bar for sheetrock walls to accomplish this.

M. All exterior junction boxes in the ground shall be concrete type with traffic rated tops.

N. Where concrete flooring or paving must be cut to install MEP systems, contractor shall take measures to prevent damaging existing underground services. Contractor shall utilize ground penetrating radar and electrical circuit tracing equipment in the area to be excavated to determine the existence of underground services. When saw cutting, limit the depth of the cut to less than the thickness of the concrete. Breakout the concrete manually with special care in areas of possible underground services.

PART 2 - MATERIALS AND METHODS

2.1 RACEWAY SYSTEMS

A. REQUIRED: Complete raceway systems for all wiring. This includes, but is not limited to feeders, branch circuit wiring, low voltage lighting controls, temperature controls wiring, data cabling, video cabling, sound systems wiring, security systems wiring 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, above inaccessible ceilings and sleeves through walls. Control and interlock wiring shall be provided under the Mechanical Section. Refer to technology drawings for conduit sizes and locations for technology and security systems.

B. SLEEVES

01 Provide sleeves for all wiring passing through walls, floors not on grade and roof slabs.

02 Sleeves shall be sized with maximum 40% conduit fill.

03 Sleeves through floors shall be increased one trade size with a minimum size of 2” to provide spare capacity for the future.

04 Floor slab sleeves shall extend minimum 3" above floor level. Fully grout and

seal the penetration around the sleeve to prevent water from entering the space below. Grouting shall form a 1” curb above floor level around the sleeve.

05 Sleeve interiors through floors and through fire walls shall be fire caulked or otherwise protected to maintain the fire rating of the wall.

B. LOW VOLTAGE CONDUIT:

01 Conduit, j-boxes, and pull boxes shall be provided by the Division 26 contractor for installation of low voltage devices and cabling. Refer to other sections and the drawings for specialty box requirements.

02 Minimum size conduit for data shall be 1”.

03 Where conduits for low voltage cabling are installed above grade they shall utilize the following radius bends and 90 degree factory elbow to exit the wall.

a. Minimum bend radius for copper cabling shall match a standard radius factory elbow:

Above Grade Low Voltage Copper Cabling Conduit Minimum Bend Radius			
Conduit Size	Bend Radius	Conduit Size	Bend Radius
3/4"	4.5”	2”	9.5”
1”	5.75”	2.5”	10.5”
1.25”	7.25”	3”	13”
1.5”	8.25”	4”	16”

b. Minimum bend radius for fiber cabling shall match a long radius factory elbow, equal to or exceeding the fiber bend radius:

Above Grade Fiber Conduit Minimum Bend Radius			
Conduit Size	Bend Radius	Conduit Size	Bend Radius
3/4"	12”	2”	24”
1”	12”	2.5”	24”
1.25”	24”	3”	36”
1.5”	24”	4”	36”

c. Final section of the elbow shall be no higher than 18” above the ceiling and be flat/horizontal.

d. Provide a single piece, protective, nylon bushing on the end of all low voltage conduits. Split bushings shall only be acceptable where there are existing cables to be protected or with prior written approval.

e. A telecommunications LB with integral cable radius device may be used for changes in low voltage conduit above grade as identified below and where indicated on the drawings.

1) Acceptable Uses:

i. Where a long radius sweep conduit cannot fit within the space

ii. Where a low voltage conduit riser on the building exterior penetrates the building envelope.

iii. Where an additional pull point is needed with a change in conduit direction and a pull box will not fit or would be

located in an undesirable location.

iv. Additionally as approved by the Owner/Engineer.

2) Acceptable Products

i. Madison Electric SmartLB

ii. Or equal with prior written approval.

04 Where conduits for low voltage cabling are installed below grade they shall utilize a large radius sweeps.

a. Minimum bend radius shall be:

Below Grade Low Voltage Conduit Minimum Bend Radius			
Conduit Size	Bend Radius	Conduit Size	Bend Radius
3/4"-2”	24”	2.5”-4”	36”

C. 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.

D. INSTALLATION:

01 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 conduits at least 8" away from any heat producing items.

a. Do not install conduit below grade or in floor slabs unless there is no other way to conceal conduit.

b. Equipment feeders in mechanical rooms or mechanical yards shall be run above grade.

c. Conduits in mechanical yards shall be routed overhead to the equipment being served in a manner that maintains access and does not interfere with equipment, piping, devices, etc. Conduits may be mounted on the underside of piping supports provided by the mechanical contractor.

d. Major feeders from switchboard to distribution panels or electrical panels may be run underground where they consist of either:

1) Single runs containing 4/0 or larger wire

2) Parallel runs of 3/0 or larger.

e. Do not install conduit on roof unless specifically shown to be on the roof or authorized in writing by the Engineer.

f. All junction and pull boxes above accessible ceilings shall be mounted so that the access panel is no higher than 18” above the ceiling.

02 ROUTING: Conduit shall be installed parallel to building coordinates, except for underground feeders from panel to panel may be installed in the most direct manner except where indicated on the drawings. Install all horizontal conduit at structure unless mounted to a wall.

03 EXPOSED RACEWAY: Run parallel 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. Exposed

conduit visible in public and finished spaces shall be painted to match.

04 SUPPORT: Provide adequate and sturdy support for all parts of raceway system.

a. Conduit concealed in walls or slabs may be supported with wire hangers, provided they are of heavy gage and spaced to give adequate strength.

b. Exposed conduit must be supported with materials specifically made for this purpose; do not use wire hangers.

c. Do not attach any parts of raceway system to air conditioning ducts or ceiling systems.

d. Wiring above ceiling without conduit shall be supported from structure or wall with J hooks, cable rings, or other manufactured devices designed for this service.

e. Unless described by detail on the drawings, provide Tolco Pipe Pier, Caddy Pyramid, Eaton Dura-Blok or similar strut based supports four feet on center to support conduit on the roof. Select for proper weight loading. Confirm with other trades that conduit supports are compatible with the roofing system prior to installation.

f. Provide Eaton Dura-Block strut based supports four feet on center to support conduit on or above Avadek or similar fluted canopies. Align support with and place in the bottom flute. Select for proper weight loading. Equal strut based supports with integral drainage channel shall also be acceptable.

05 CONTINUITY: Make all joints and connections in a manner which will ensure 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.

06 PULL BOX LOCATIONS: As required by the National Electrical Code and utility provider requirements.

07 EXPANSION FITTINGS: Install O. Z. or equal expansion fitting in each run of conduit which crosses a building expansion joint, and in all runs longer than 200 feet.

08 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. Conduit through slabs at grade shall be PVC coated rigid galvanized steel.

09 PULL WIRE: Install nylon pull cord in all low voltage raceway systems and 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 low voltage 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 ACOUSTICAL CONTROL: Provide moldable putty installed per manufacturer's recommendations for acoustically sensitive or sound critical locations.

a. Examples of acoustically sensitive locations:

1) Libraries

2) Conference Rooms

3) Recording studios

4) Music Halls

5) Performing arts spaces

6) Clinics

7) Counselors offices

8) And similar spaces where noise transfer from one space to another is not desirable.

b. Nelson FSP Firestop Putty, STI Putty & Putty Pads, 3m Moldable Putty Pads, ATS Acoustical Putty Pads, or approved equal.

13 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.

E. MANUFACTURERS: All components of raceway systems must bear U. L. label.

2.2 CONDUIT

A. CONDUIT TYPES

01 RIGID GALVANIZED STEEL – Threaded fittings

02 PVC COATED RIGID GALVANIZED STEEL - All PVC coated rigid galvanized steel conduit shall comply with UL 6 and NEMA No. RN-1 standards and meet ASTM D870 and ASTM D2247 testing requirements. Provide PVC coated couplings, fittings and pulling elbows matching the installed conduit.

a. Plasti-Bond REDH2OT with ETL Verified PVC-001 label

b. Perma-Cote with ETL Verified PVC-001 label

c. KorKap with ETL Verified PVC-001 label

d. ABB Ocal

e. Or approved equal with ETL Verified PVC-001 label.

03 PVC CONDUIT – Schedule 80

04 EMT – Steel conduit

a. Provide steel compression fittings.

b. Provide insulated throat watertight fittings where conduit is exposed to dampness inside building.

05 FLEXIBLE METAL CONDUIT – Greenfield, galvanized steel conduit for field installation of conductors ((maximum 24" long except light fixtures up to 72"). All flexible conduit shall be listed for grounding per NEC 250.118(7).

06 LIQUID TIGHT FLEXIBLE METAL CONDUIT (LFMC) – SealTite Type UA galvanized steel conduit with PVC waterproof coating for field installation of

conductors (maximum 24” long except light fixtures up to 72”). All LFMC shall be listed for grounding per NEC 250.118(7).

a. LFMC in food production areas, food preparation areas, concessions rooms, kitchens, food production splash zones and wash down areas, food processing, meat packing, restaurants, poultry packing, pharmaceutical facilities, and similar areas shall incorporate a bacteria growth inhibiting PVC jacket that may be cleaned without degredation to the jacket bleaching agents.

1) AFC SZ

b. Liquid-Tuff by Kaf-Tech or AFC shall also be acceptable.

07 MC CABLE

a. Flexible steel or lightweight steel conduit with factory installed, stranded, color coded copper conductors, green insulated ground wire and polypropylene sheath/tape. Aluminum armored MC cable shall not be acceptable. Armor exterior shall be color coded for contained conductors/voltage identification. Conductor insulation shall be 600V, 90°C rated and color coded to match the building standard color coding.

1) AFC MC Tuff.

2) MC cable for lighting shall be AFC MC Tuff Luminary Cable with 12-3 for power (H-H-N-G) and 16-2 (Violet/Pink) for 0-10V dimming connections.

3) Equal by Kaf-Tech shall also be acceptable.

08 SURFACE RACEWAY – Wiremold steel raceway, ivory finished and mechanically connected to walls or casework. Type based on application. (only allowed where specifically noted on the drawings)

B. TYPE OF CONDUIT FOR VARIOUS LOCATIONS:

01 UNDERGROUND: Rigid galvanized steel or Schedule 80 PVC.

a. Conduit in contact with concrete shall be PVC coated, rigid galvanized steel except conduit for ductbanks shall be PVC.

b. Encase underground electrical feeder and service conduit not under building slab in a 3" red concrete envelope located a minimum of 24" below finished grade to top of envelope (48" if above 600 volts) with detectable tracer tape installed on top of red concrete. Where more than one conduit is installed in the same trench, provide manufactured conduit support spacers to organize conduit and ensure proper concrete encasement. Notify Inspector for inspection of duct bank at least 24 hours prior to concrete placement.

c. Conduit, except service entrance feeder/ductbanks, below building slab do not require concrete encasement except where indicated on the drawings or where required by code/utility requirements.

d. Conduit for telephone, data, etc. does not require concrete encasement except where indicated on the drawings or where required by code, or utility requirements.

e. Install PVC coated, rigid galvanized steel, long radius elbows where conduit turns up towards grade. Include a straight length section to a minimum of 6” above grade/concrete slab or extended to final equipment connection, whichever is greater.

f. Conduit depth:

1) Do not run any conduit within the slab.

i Conduit 1” and smaller may be run just under the concrete.

ii Larger conduit shall be minimum 24” below finished floor.

2) All electrical feeders outside the building shall be installed 4ft to the top of the encasement.

3) Electrical service feeder/ductbank shall be installed 4ft to the top of the encasement.

4) Miscellaneous circuits, including site lighting circuits, outside the building shall be installed at ~3ft using a Ditch Witch or equivalent trenching equipment.

5) Low voltage and technology conduit outside the building shall be installed at ~3ft using a Ditch Witch or equivalent trenching equipment.

i Low voltage and technology conduits may be run in the same trench as electrical conduits while maintaining minimum 1ft above electrical conduits and a minimum cover of 2ft.

6) Where electrical and civil/plumbing underground is in conflict, civil/plumbing installations shall have priority. Electrical and technology conduit depth shall be increased or decreased to eliminate conflict while maintaining minimum cover of 2ft.

g. All underground conduit bends and 90s shall be long radius sweeps.

1) Minimum 24” radius for power.

2) Refer to low voltage conduit radius tables in this document.

h. Provide detectable tracer tape located 6” above underground conduits with identifying markings and colored per APWA color-code:

1) Electrical Power Red

2) Low Voltage Orange

3) Scotch Detectable Buried Barricade Tape 400 Series or equal.

02 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.

03 IN MASONRY WALLS: Galvanized steel EMT with steel, watertight compression fittings.

04 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. Do not use EMT, IMC or PVC conduit.

a. Conduit under overhangs, canopies, open air structures, and similar spaces shall be considered exposed outside of the building.

05 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.

06 EXPOSED ON MASONRY OR PLASTER WALLS IN FINISHED AREAS (only where specifically noted on the Drawings):

a. For power systems Wiremold V500 metallic raceway, ivory finish, complete with various boxes, devices, offsets and transitions.

b. For data systems provide Wiremold 2000 Series or larger consistent with cabling requirements, ivory finish, metal raceway with various devices, offsets and transitions.

c. Length and quantities as indicated on the drawings.

d. All raceway shall be mechanically fastened to walls and surfaces. No tapes or glues allowed.

07 IN CONCRETE SLABS: Do not install conduit in concrete slabs.

08 FLEXIBLE METAL CONDUIT CONNECTIONS: Use only for connection to lights, motors and transformers from rigid conduit system.

a. Do not loop flexible conduit between light fixtures or receptacles.

b. Provide liquid tight construction and fittings in wet, damp or outside areas.

c. Connections to mechanical equipment in main mechanical or boiler room, and kitchen equipment shall be in liquid tight except do not install liquid tight flex inside an air handling unit room.

d. Minimum length shall be 18”. Maximum length shall be two feet except light fixture whips may be up to six feet.

09 LIGHT FIXTURE WHIPS: MC cable or 1/2” Greenfield Flex Conduit not to exceed six feet in length.

10 CONDUIT SLEEVES THROUGH WALLS AND FIREWALLS: EMT extending a minimum of 3” beyond wall with protective bushing at each end. Size to handle cabling with a maximum of 40% fill.

11 SLEEVES THROUGH FLOORS:

a.

C. MINIMUM CONDUIT SIZE: 3/4"

D. FITTINGS:

01 RIGID CONDUIT: All rigid galvanized steel conduit shall have threaded fittings with insulated bushings.

02 EMT CONDUIT: Provide insulated bushings for all EMT conduit 1" or larger or housing #6 or larger wires.

03 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.

04 TELEPHONE, DATA AND LOW VOLTAGE CONDUIT: Provide protective bushing on the end of telephone, data, sound system or other low voltage conduit stubbed into the ceiling cavity.

a. Bridgeport 90° Insulated Bushings

b. Bridgeport Mighty-Rite Split Bushings

c. Raco Specification Grade Insulated Bushings

d. Raco Universal Split Insulating Bushings

e. Or approved equal.

E. SPARE CONDUIT: Provide five empty 1” conduit from all recessed electrical panels to empty wireway above the nearest accessible ceiling.

F. 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.

01 All conduit bends and 90’s for technology conduits shall be long radius sweeps.

a. Refer to low voltage conduit radius tables in this document.

02 Provide protective end fittings on all low voltage conduits.

2.3 LOW VOLTAGE PATHWAYS

A. PRIMARY PATHWAY CONDUIT AND SLEEVES:

01 Provide conduit pathways per the drawings as specified above.

02 Provide multi-cell innerduct in primary pathways as indicated in the drawings.

B. BUILDING PRIMARY PATHWAY CABLE TRAY:

01 Provided and installed by Division 26 under this specification.

02 Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

03 The Contractor shall provide all necessary labor, supervision, materials, equipment, tests, and services to install a complete basket tray system within the building as shown on the Drawings.

04 Provide cable tray of types and sizes indicated; with connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

05 Material and finish specifications for each metal cable tray type are as follows:

a. Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510 and shall be coated after the wire basket runway has been fabricated in accordance with ASTM A123 (CSA Type 1). All hot-dip galvanized sections must be returned to the point of manufacture after coating for inspection and removal of all icicles and excess zinc. Failure to do so may result in damage to cables and/or injury to installers.

1) Cable tray installed above ceiling or in unfinished spaces shall be electro-plated zinc in accordance with ASTM B633.

2) Sections of cable tray installed exposed in finished spaces shall have a finish selected by the architect from all available finishes.

3) Where installed in finished or public spaces provide a plastic

insert with sides sized to match the cable tray, finish to be selected by the architect from all available finishes.

b. Electro-Galvanized Zinc: Cable tray, support accessories and miscellaneous hardware shall be coated in accordance with ASTM B633 SC3. All threaded components shall be coated in accordance with ASTM B633 SC1.

1) Where accessories or hardware are not available in electro-galvanized zinc finishes provide recommended finish as listed by the manufacturer.

c. 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.

06 Wire basket 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 wire basket sides (flanges) shall be rounded during manufacturing for safety of cables and installers.

07 Wire basket cable tray shall conform to the following nominal criteria:

a. Straight sections shall be furnished in standard lengths.

b. Wire basket shall have a 4-inch usable loading depth by the width identified on the drawings.

c. All fittings shall be field formed as needed.

d. The installation and all fittings of all raceways shall allow Category 6 cable and fiber optic cable to be pulled in and through in such a manner as to not exceed the pulling tension or minimum bending radius.

1) All turns and tees shall be made with radius 90s using premanufactured kits designed for that purpose to maintain cable bend radii.

2) Minimum radius shall be 5 inches.

3) No field bending will be approved.

e. All splicing assemblies shall be the bolted type using flange locknuts.

f. Cable tray supports shall be center support hangers, trapeze hangers or wall brackets and shall be supported by 1/4 inch or 3/8 inch diameter rods.

g. Special accessories shall be furnished as required to protect, support and install all cable tray support systems.

08 Accessories (connectors, splice plates…) shall be painted to match tray finish.

09 Basis of Design Manufacturer: Legrand Cablofil

a. Wire Basket Tray

1) CF54/100 (EZ) 2” D x 4” W Wire Basket Tray

2) F105/200 BC (EZ) 4” D x 8” W Wire Basket Tray

3) CF105/300 BC (EZ) 4” D x 12” W Wire Basket Tray

4) CF105/600 BC (EZ) 4” D x 24” W Wire Basket Tray

5) Refer to the drawings for cable tray sizes at each location.

b.	5” Radius Tee 90° Kit	RADT 90 KIT
c.	12” Radius Tee 90° Kit	RADT 90 12 KIT
d.	Elevation Change Hinge	EAC KIT
e.	Universal Bracket	FASUCB
f.	Universal Wall Bracket	CRP
g.	Vertical Bracket	FV
h.	Trapeze Support	FAS P
i.	Center Hanger	FAS PCH
j.	Wall/Floor Termination Kit	HB 2 KIT
k.	Splice Kit	SWK
l.	Grounding Lug Kit	GNDCL
m.	Plastic Insert with Sides	INSERTPPxx/xx
n.	Blind End	BE

10 Acceptable Manufacturers:

a. BASOR

b. Cooper B-Line

c. Legrand Cablofil

d. Pentair Hoffman

e. Other equivalent products that meet these specifications and warranty with prior written approval.

C. TELECOM ROOM CABLE TRAY

01 Provided and installed by the Division 27 Structured Cabling Contractor.

D. PRE-MANUFACTURED FIRE-RATED AND ACOUSTICAL PATHWAYS

01 Provided and installed by Division 26 under this specification.

02 Horizontal Pathway Firestop Sleeve:

a. Provide wall kit or floor kit to match installation.

b. Provide multi-slot frame to gang multiple pathways together.

c. STI EZ-PATH

1) Series 44+ 4” Fire Rated Pathway

2) Series 33 3” Fire Rated Pathway

3) Series 22 2” Fire Rated Pathway

03 Vertical Pathway Firestop Sleeve:

a. 4” conduit through intermediate floor slabs. Floor slab conduit shall extend minimum 3" above floor level. Fully grout and seal the penetration around the sleeve to prevent water from entering the space below. Grouting shall form a 1” curb above floor level around the sleeve.

b. Sleeves through floors shall have a retrofit firestop device installed at each end to maintain the fire rating of the wall or floor.

c. STI EZ-PATH

1) EZDR400 4” Fire Rated Retrofit Pathway

04 Smoke and Acoustical Pathway

a. May be used to create the required pathways in non-rated applications.

b. STI EZ-PATH

1) NEZ44 4” Smoke & Acoustical Pathway

2) NEZ33 3” Smoke & Acoustical Pathway

3) NEZ44CK 4” Smoke & Acoustical Ceiling Pathway

4) NEZ33CK 3” Smoke & Acoustical Ceiling Pathway

2.4 PULL BOXES

A. REQUIRED: Pull boxes, junction boxes, wiring troughs and cabinets wherever required for proper installation of various electrical systems.

B. ABOVE GRADE 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. Boxes outside shall be steel NEMA 3 Type. Pull boxes near cooling towers shall be PVC coated aluminum or stainless steel.

C. UNDERGROUND CONSTRUCTION: Underground enclosures shall be Hubbell Quazite series underground enclosure, UL listed and manufactured by Lenoir City, Inc. Equal underground enclosure manufactured by CDR with ETL verification shall also be acceptable. Enclosures, boxes and covers are required to conform to all test provisions of the most current ANSI/SCTE 77 “Specification for Underground Enclosure Integrity” for ANSI Tier 15 applications for both covers and boxes. All covers are required to have the tier level rating embossed on the surface with 2 bolts. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box & cover) are manufactured using matched surface tooling. Independent third party verification or test reports stamped by a registered professional engineer certifying that all test provisions of this specification have been met are required with each submittal. Electrical contractor shall provide proper size of underground enclosure to coordinate with the conduits and feeders per national electrical code.

2.5 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. Provide "gang" boxes where devices are shown grouped. Use hot dipped galvanized cast iron for floors or exterior locations. Boxes outside shall be steel NEMA 3 Type.

C. TYPES FOR VARIOUS LOCATION:

01 CEILINGS: 4" square, 2-1/8" deep.

a. All devices installed in lay-in ceilings shall have bracket to support device from ceiling tees.

b. Caddy Heavy Duty T-Grid Box Hanger or equal.

02 DRY WALLS: Standard galvanized switchbox, gangable for multiple switches or receptacles.

a. Provide 4" square, 2-1/8" deep galvanized switch box (1900) where additional volume is required for wiring.

b. Provide 4" square, 2-1/8" deep boxes for data outlets.

c. Provide shallow boxes where necessary.

d. Provide Caddy TSGB16, RBS16 or equal mounting bar to fully support and align box with studs.

03 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.

a. Raco Block-Loc

b. Or approved equal.

04 FLOOR: Watertight, adjustable, cast iron.

05 SURFACE MOUNTED: Boxes surface mounted on walls or floor shall be Bell, cast aluminum box with appropriate plate and threaded hubs.

06 SPECIALTY:

a. Flush Mounted Boxes for A/V outlets:

1) Provided and installed under Division 26. Refer to drawings for specialty box requirements.

2) 2-gang shall have minimum 2-1.25” knockouts/lugs. 3-gang shall have minimum 1-1.25”, 1-1” and 1-3/4” knockouts/conduits/lugs. Provide number of gangs as indicated/required.

i Hubbell HBL260, HBL263

ii Raco 260, Raco 260H, Raco 263

iii Or approved equal.

3) Provide all mounting hardware as required.

b. Recessed Wall Mounted Boxes for wall mounted displays, electronic signage and similar installations:

1) Provided and installed under Division 26. Refer to drawings for specialty box requirements.

2) 2-gang multi-service boxes for power and low voltage devices shall have minimum 1-1.5” and 1-1.25” conduits/knockouts/lugs for low voltage cabling and 1-3/4” conduit/knockout/lug for power. Coordinate box location with mounting hardware and equipment to be served.

i Hubbell NetSelect NSAV62M with NSAV6C white cover plate with cable exit.

ii Or approved equal.

3) 5-gang multi-service boxes for power and low voltage devices behind a display shall have minimum 2-2” conduits knockouts for low voltage cabling feed-thru, one (1) internal single gang opening, and four (4) single gang knockouts. Provide separator plates for power and low voltage. Coordinate box location with

mounting hardware and equipment to be served.

i Hubbell HRWB25xxx with cover finish to be selected by architect.

ii Or approved equal.

4) Provide all mounting hardware as required.

c. Recessed Wall Mounted Boxes for teacher and presenter stations.

1) Provided and installed under Division 26. Refer to drawings for specialty box requirements.

d. Large Recessed Wall Mounted Boxes for multiple computer stations and computer labs.

1) Provided by Division 27 and installed under Division 26. Refer to drawings for specialty box requirements.

2) Coordinate with Division 27 for specialty faceplates for low voltage devices.

3) Provide blank faceplates on all unused gangs/openings.

e. Ceiling AV Boxes for Projectors:

1) Provided by Division 27 and installed under Division 26. Refer to drawings for specialty box requirements.

f. Floor Boxes: Refer to 26 27 26 Wiring Devices.

g. Outlet Boxes in Corrosive Areas: Where PVC Coated conduit is required, provide compatible PVC coated cast aluminum box by the conduit manufacturer.

h. Pedestal Mounted Receptacles (PMR) or Devices (PMD):

1) Above floor, cast aluminum housing suitable for line and low voltage devices.

2) In kitchens, exterior spaces, washdown areas, or similar spaces where water may pool on the surface the PMR/PMD shall be installed ~2” above finished floor. The gap beneath the PMR/PMD shall be filled with grout and the finished floor brought up to the bottom of the housing using a matching transition piece.

3) Single Service Pedestals:

i Basis of Design: Water Saver Series Service Fittings

a. 1-Gang, 2-Face: E400SA-WS

b. 2-Gang, 2-Face: E600SA-WS

ii Or approved equal.

4) Specialty Outlet Single Service Pedestals:

i Shall only be allowed where all of the standard single service pedestal devices are of insufficient size to fit the necessary NEMA, California Standard, or similar specialty device.

ii Hubbell SA6685G/SA6686G

iii Hubbell SA6687G/SA6688G

iv or approved equal.

D. MOUNTING PLATES: Boxes mounted in casework or drywall construction shall have extension plates matched to casework/wall thickness so the box can be mounted flush with the metal stud and the wiring device mounts flush with the casework/wall surface.

E. 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 for minimum sound transmission, grouping outlets on the same side of the wall. "Through-the-wall" type boxes are not permitted.

F. CASEWORK COORDINATION: Outlets above counters shall be mounted horizontally just above the back splash. Mount horizontally in the backsplash where noted and where above the backsplash would conflict with other trades' equipment such as markerboards and tackboards, refer to architectural drawings and elevations. Outlets below counter shall be mounted in the knee space. Refer to casework drawings. Outlets shown together shall be mounted close together, not on adjacent studs. Provide appropriate mounting hardware to support between studs.

2.6 CONDUCTORS

A. REQUIRED: A complete system of conductors in all raceway systems except where shown otherwise. No conductors are to be installed in telephone conduit. Emergency or exit circuitry shall be installed in a separate raceway system.

B. BUILDING WIRE: 600 Volt, stranded, soft drawn annealed copper, 98% conductivity, continuous from outlet to outlet. All wires shall be color coded with same color connected to same ungrounded phase throughout the installation.

01 Minimum building wire size shall be #12.

a. Exceptions

1) Remote control wire may be #14.

2) Dimming wire may be #16 color coded violet (purple) and pink per NEMA Standards Publication NEMA 100-2021.

02 All wire shall be type THHN, THW-2 THWN-2 (wet rated for 90° C), or XHHW-2.

a. Exceptions:

1) Where providing connection for circuits containing variable frequency drives (VFDs) wiring shall be type XHHW-2 insulated conductors.

2) Dimming wiring may be type TFFN stranded wiring.

C. BURIED GROUND WIRE: Conductors used to interconnect ground rods of a grounding triad or supplemental ground loop shall be minimum #2, uninsulated, tinned, stranded copper wire. Connect this wire to rod with short length of same wire, thermo-welded to loop and rod.

D. MANUFACTURERS: Collier, General Cable, General Electric, Simplex, Triangle and Southwire Co.

E. CONNECTORS: Make all connections on #10 and smaller wire with Code approved solderless pressure type insulated connectors; Ideal Wingnut, 3M Spring Connectors, or equal. 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.

2.7 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. Where a specific receptacle type is indicated on the drawings provide new or modify existing cord/whip with the matching plug type. Where a general NEMA/IEC/CS receptacle type is indicated on the drawings provide a receptacle matching the provided equipment connection. Confirm connections and equipment requirements prior to rough-in.

01 Make final connections to and provide matching cords/plugs for equipment and devices furnished by others. In particular provide and install all cords, plugs, whips, hardwiring, etc. for shop equipment, welders, cord reels, disposers, ice machines, and similar equipment.

02 Make final connections to and provide matching cords/plugs for Owner furnished equipment and devices. In particular provide and install all cords, plugs, whips, hardwiring, etc. for Owner provided shop equipment, copy machines, system furniture, and similar equipment.

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 other equipment subject to vibration with not less than 18" or 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" or more than 24” of flexible conduit at each connection to floor mounted transformers.

E. CONNECTIONS TO RECEPTACLES: Multiple devices on a circuit such as receptacles shall be back wired with pigtail so device does not provide continuity path.

01 Feed through connections for GFCI receptacles to provide protection for downstream receptacles is not allowed.

2.8 CIRCUITRY

A. The intent of the drawings is to indicate schematically the circuitry required.

B. 20 amp, single phase branch circuits serving lighting may be grouped in a single raceway provided a neutral conductor is installed for each circuit requiring a neutral.

01 Where lighting controls are listed as having Class 1 connections for the 0-10V wiring, all dimming wiring shall be installed as Class 1 wiring in raceway with the line voltage lighting circuits.

C. 20 amp, single phase branch circuits serving receptacles may be grouped in a single raceway provided a neutral conductor is installed for each circuit requiring a neutral.

D. Do not install more than four current carrying conductors in a conduit, except a total of six #12 or #10 current carrying conductors, and no more than ten conductors including grounding conductors, may be installed in 3/4" or larger conduit.

E. NEMA power outlet circuits shall have dedicated raceways.

F. Segregate data processing circuits and stage dimming circuits from other types of circuits.

G. Do not install 480/277 volt conductors in the same conduit with 240/208/120 volt conductors.

H. 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.

2.9 SYSTEMS COLOR CODING AND IDENTIFICATION

A. All junction and pull boxes shall be marked noting electrical circuits and relay circuits of wiring within the box. Circuit labels shall be written on the cover in black permanent marker and shall be readable from the floor level without removing the cover. Additionally, junction box housings shall be color coded as follows.

01 J-boxes and covers in finished spaces shall be painted to match architectural finishes. Write circuit number on inside of j-box cover.

02 J-boxes and covers in unfinished spaces accessible to the public such as welding shops, HVAC labs, automotive shops, etc. shall be painted to match.

a. Write circuit number on outside of j-box cover.

b. Write circuit number on inside of j-box cover where paint color is too dark to maintain readability of marker labeling.

03 Do not paint the covers except in finished spaces.

04	Emergency and Exit Circuits:	Red
05	Normal Power 120V/208V/240V:	Blue
06	Normal Power 277V/480V:	Yellow
07	HVAC Controls:	Green

B. All conductors shall have a consistent color coding throughout the facility as indicated below. If the existing facility has a consistent but different color coding, match existing.

01 Contractor may use colored tape marking for size 8 and larger phase and neutral conductors, and size 4 and larger ground conductors.

02 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.

03 480/277 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

04 208Y/120 VOLT SYSTEMS: Conductors shall have insulation of the proper color

as listed below:

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green
Isolated Ground	Green w/ yellow stripe

C. Identify each conductor of all systems at each panel, pull box and at each outlet with permanently attached, wrap around, adhesive markers.

D. Equipment labels shall be provided on each receptacle and switch cover plate identifying the panel and circuit number (HA-2 for example.)

2.10 GROUNDING

A. Reference section 26 05 26 Grounding and Bonding for Electrical Systems.

2.11 SIGNS AND NAMEPLATES

A. Provide all signs/labels as required by local codes and authority having jurisdiction.

B. Provide an engraved nameplate for each panel, switchboard, transformer, disconnect switch, fused switch, and starter stating the name as listed on the drawings (or load serviced), equipment voltage and where its power is derived. Provide short circuit label on all new switchboards and panelboards.

C. Refer to individual equipment specifications for additional labels required.

END OF SECTION 26 05 00

SECTION 26 05 26 - GROUNDING AND BONDING;

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 26 41 13 – Lightning Protection Systems

C. Section 27 00 00 – General Technology Requirements

D. Section 27 10 05 – Grounding and Bonding for Technology Systems

E. Section 28 10 00 – Physical Security General Requirements

1.3 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground access wells.

1.4 REFERENCE STANDARDS

A. ANSI/TIA-607-B-2011 - Commercial Building Grounding and Bonding Requirements for Telecommunications

B. ANSI/NECA/BICSI-607 - Telecommunications Bonding and Grounding Planning and Installation methods for Commercial Buildings

C. IEEE C2-2007 - National Electrical Safety Code

D. IEEE 81 – IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

E. IEEE Std. 837-2002, or latest version – Standard for Qualifying Permanent Connections

Used in Substation Grounding

F. LPI 175 – Lightning Protection Standards

G. Motorola R56 – Standards and Guidelines for Communication Sites

H. NECA 1 – Standard for Good Workmanship in Electrical Construction; 2015.

I. NEMA GR 1 – Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

J. NETA ATS – Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

K. NFPA 70 – National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 70E - Standard for Electrical Safety in the Workplace

M. NFPA 780 – Standard for the Installation of Lightning Protection Systems

N. UL 96 – Lightning Protection Components

O. UL 96A – Installation Requirements for Lightning Protection Systems

P. UL 467 – Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.5 GENERAL COORDINATION REQUIREMENTS

A. Drawings and Specifications are intended to be complimentary. Any work described in either of them, will be work required under this contract. Where there is a conflict between the Drawings and Specifications it shall be clarified by RFI. Barring clarification prior to bidding the most expensive option shall be included and clarification shall be made during construction.

B. Reference the Drawings, Floor Plans, Details, and Specifications for additional information. Specific grounding required as noted in the drawings, specifications, and design standards in excess of NEC 250 grounding requirements shall be done. More stringent requirements shall take precedence over NEC 250 listed minimum requirements.

C. Should any work required by the Drawings and Specifications be contrary to the requirements of the applicable codes or standards contractor shall request clarification by RFI before proceeding with the work.

PART 2 - MATERIALS AND METHODS

2.1 GROUNDING AND BONDING REQUIREMENTS

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. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

C. Do not use products for applications other than as permitted by NFPA 70 and product listing.

D. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

E. Provide a ground conductor in all raceways and cables. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

F. Grounding System Resistance:

01 Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

02 Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

G. Grounding Electrode System:

01 Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

c. Conduit containing a service or transformer grounding wire shall be grounded at each end to the grounding wire. Use conduit grounding fitting at ground rods.

02 Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

03 Metal In-Ground Support Structure:

a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

04 Ground Rod Electrode(s):

a. Provide single electrode unless otherwise indicated or required.

1) Where required to meet resistance requirements, space electrodes not less than 10 feet from each other and any other ground electrode.

b. Where electrodes are installed in concrete, building slab, or similar impervious surfaces mechanically secure the electrode with waterproof, non-shrink grout or similar suitable material.

c. Main System Ground:

1) Ground system neutral in service entrance equipment to the

building steel and three 3/4" x 10 foot, copper clad, driven ground rods.

2) Install ground rods in a grassy area outside the building in an equilateral triangle pattern, 15 feet on a side, with rod tops 12” below grade.

3) Do not install under the building, concrete or other impermeable surface without prior written approval.

4) Connect ground wire from rod to rod in a complete loop then extend to service equipment.

5) Use cadweld connections below grade.

6) Refer to drawings for additional information.

d. Provide ground access well for first connected electrode.

05 Ufer Ground (Concrete-Encased Grounding Electrode):

a. Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

b. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.

c. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

06 Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

H. Main System Ground Point:

01 Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

a. Ground Bar Size: Sized as required for all attachments with 25% space for future connections. Minimum 1/4 by 2 by 12 inches unless otherwise indicated.

b. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

I. Service-Supplied System Grounding:

01 For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

02 For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

J. Separately Derived System Grounding:

01 Separately derived systems include, but are not limited to:

a. Transformers (except autotransformers such as buck-boost

transformers).

b. Uninterruptible power supplies (UPS), when configured as separately derived systems.

c. Generators, when neutral is switched in the transfer switch.

02 Provide locally driven ground rod at each separately derived system.

a. 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.

b. Provide local auxiliary ground rod within generator footprint. Bond all major components within enclosure, EGC, and local ground rod.

03 Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

04 Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

05 Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.

06 Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

07 Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

K. Bonding and Equipment Grounding:

01 Circuit Grounds:

a. Provide a green ground wire sized per the NEC for every circuit.

b. Provide an additional green w/ yellow strip isolated ground wire for all computer and isolated ground circuits. Refer to drawings.

02 Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

a. Make firm ground to raceway system.

b. Equipment connected with flexible conduit or SealTite shall have the specified ground wire installed inside conduit. Do not install on the outside of the conduit.

c. Where enclosure is painted, remove paint where ground lugs are installed.

03 Provide insulated equipment grounding conductor in each feeder and branch

circuit raceway. Do not use raceways as sole equipment grounding conductor.

04 Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

05 Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

06 Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

07 Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

L. Low Voltage Systems

01 Telephone System Ground: Install a #6 ground wire from the telephone board to ground rod at the telephone board and connect to building service or TMGB/TGB.

02 Sound System Ground: Install a #6 ground wire from the amplifier equipment to the ground bar in the Service Entrance Equipment or TMGB/TGB.

03 Public Address System Ground: Install a #6 ground wire from the amplifier equipment to the ground bar in the Service Entrance Equipment or TMGB/TGB.

04 Data System Grounding Network:

a. Reference Standards and Codes:

1) IEEE C2-2007 - National Electrical Safety Code

2) IEEE Std. 837-2002, or latest version – Standard for Qualifying Permanent Connections Used in Substation Grounding

3) ANSI/TIA-607-B-2011 - Commercial Building Grounding and Bonding Requirements for Telecommunications

4) NFPA 70E - Standard for Electrical Safety in the Workplace

5) ANSI/NECA/BICSI-607 - Telecommunications Bonding and Grounding Planning and Installation methods for Commercial Buildings

6) UL 467 - Standard for Grounding and Bonding Equipment

b. Install copper grounding bar in each data room of sufficient length for all system grounding connections in the space with a minimum length of 16”, Hubbell Premise Wiring or equal. All holes shall be pre-drilled/tapped. Mount on wall with standoff isolators.

c. Extend minimum #3/0 telecommunications bonding backbone (TBB) wire from the MC/MDF ground bar to the service entrance ground bar in the main distribution panel.

d. Provide minimum #3/0 TBB ground wire between data closets per industry standards.

e. Additional bonding requirements:

1) Extend additional bonding wire from data room ground bar to local steel structure. Bonding wire to local steel shall be minimum #3/0 in MC/MDF and minimum #6 in IC/IDF.

2) Extend additional bonding wires to sound equipment,

panelboards, A/V systems, etc. as indicated on the drawings.

f. All telecommunications bonding wires shall be installed in raceway and be continuous without splices.

1) Label all pull boxes “TELECOMMUNICATIONS GROUNDING BACKBONE”.

2) Any splice/taps shall require written approval by the Engineer prior to being made.

3) Connections shall be made in an accessible location within telecommunications spaces or j-box with an exothermic weld. Where located above ceiling the connection shall be inside an 8”x8”x6” j-box with cover. Affix a label to the j-box cover and on the ceiling grid below reading “TELECOMMUNICATIONS GROUNDING BACKBONE SPLICE”.

g. Connections to the telecommunications main grounding busbar (TMGB) and telecommunications grounding busbar (TGB) shall be made with 2-hole irreversible compression lugs.

h. Connection from TMGB/TGB to low voltage cabinets/equipment shall be #6 wire by installing contractor.

i. Size all grounding conductors per TIA-607-B.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

01 Provide products listed, classified, and labeled as suitable for the purpose intended.

02 Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 00:

01 Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare, tinned, copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

01 Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

02 Unless otherwise indicated, use exothermic welded connections for all ground connections.

03 Manufacturers - Mechanical and Compression Connectors:

a. Advanced Lightning Technology (ALT): www.altfab.com

b. Burndy LLC: www.burndy.com

c. Harger Lightning & Grounding: www.harger.com

d. Thomas & Betts Corporation: www.tnb.com

04 Manufacturers - Exothermic Welded Connections:

a. Burndy LLC: www.burndy.com/

b. Cadweld, a brand of Erico International Corporation: www.erico.com

c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com

D. Ground Bars:

01 Description: Copper rectangular ground bars with mounting brackets and insulators.

02 Size:

a. Building Primary Ground Point (PGP): 4" x 24" x 1/4"

b. Building Secondary Ground Point (SGP): 4" x 12" x 1/4"

c. Telecommunications Main Grounding Busbar (TMGB): 4" x 20" x 1/4"

d. Telecommunications Grounding Busbar (TGB): 2" x 16" x 1/4"

e. Lengths shall be sized as required for the applicable connections with an additional 25% capacity for future growth. Minimum length shall be 14".

03 Holes for Connections: As indicated or as required for connections to be made.

04 Manufacturers:

a. Advanced Lightning Technology (ALT): www.altfab.com

b. Erico International Corporation: www.erico.com

c. Harger Lightning & Grounding: www.harger.com

d. Hubbell Premise Wiring: www.hubbell.com

e. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com

E. Ground Rod Electrodes:

01 Comply with NEMA GR 1.

02 Material: Copper-bonded (copper-clad) steel.

03 Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

a. Sectional rods may be used when rods are longer than 10 feet.

F. Ground Access Wells:

01 Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected vehicular load at the installed location.

a. Minimum ANSI TIER 15 where located in driveways, parking lots, or other areas subject to occasional heavy vehicular traffic.

b. ANSI TIER 8 where located adjacent to areas requiring ANSI TIER 15 above.

c. Minimum ANSI TIER 5 at all other locations.

02 Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.

a. Round Wells: Not less than 8 inches in diameter.

03 Depth: As required to extend below frost line to prevent frost upheaval, but not

less than 10 inches.

04 Cover: Factory-identified by permanent means with word "GROUND".

05 Manufacturers:

a. Advanced Lightning Technology (ALT): www.altfab.com/

b. Erico International Corporation: www.erico.com/

c. Harger Lightning & Grounding: www.harger.com/

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes:

01 Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

02 Use driving sleeves or couplings when driving ground rods into the earth.

a. Drive exterior rods until tops are at least 2 inches below final grade unless otherwise indicated. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor. Use driving sleeves or couplings when driving ground rods into the earth.

03 Where the ground is augured to install the ground rod, backfill with Bentonite or similar material.

04 Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated.

05 Make connections without exposing steel or damaging coating if any

D. Make grounding and bonding connections using specified connectors.

01 Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

02 Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

03 Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

04 Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

05 Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260500.

3.2 TESTING

A. Grounding System Tests:

01 Notify the Owner's representatives three days prior to scheduled testing dates so they may be present at the time of testing.

02 Perform all ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

03 Prior to beginning work:

a. Perform a "Wenner four-point" soil resistivity test.

04 Certified measurements to be taken and submitted prior to connection to main service utility ground.

a. Upon completion of the ground installation and before connection to the permanent facility power, the electrical contractor shall provide at his expense, a performance measurement of the new earth grounding electrode system. The testing shall utilize either an earth resistance meter and be conducted in accordance with the IEEE Standard 3-point fall of potential method or with a Clamp-on Resistance Test meter.

1) If the 3-Point fall of potential test is utilized, the ground system must be isolated from any utility neutral connections and/or outside ground references prior to testing.

2) If the Clamp-on resistance test is utilized, a single path must exist between the ground system and a utility reference.

b. Ground grid resistance shall not exceed 5 ohms.

1) The grounding system shall pass either a 3-Point Fall of Potential test or the Clamp-on Resistance test. The minimum of 5 times the length of the electrode for a single rod, or 5 times the diagonal of a ground grid (10 times is desired). Contractor shall provide a plot of the curve of resistance vs. distance to the Owner. The conductor shall immediately notify the Owner's representative if the measured resistance is above 5 ohms.

2) The Clamp-on Resistance testing shall be completed utilizing a single ground reference path between the ground system and the reference utility. This will be accomplished either through the ground conductor of a single point ground or by means of a temporary bonding jumper between the installed ground system and a utility reference, prior to any bonding to the system. Should the measurement of the resistance be less than 1 ohm to earth, contact the Owner's representative to verify that the ground system has been designed to achieve 1 ohm. If not, the reading is likely a measurement of continuity and not ground resistance.

c. The manufacturer or an independent testing firm shall be employed for the testing and report. The contractor shall submit a copy of the test report to the Owner's representative within 10 days after testing and before the ground system becomes inaccessible.

d. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

B. Test TBB system impedance between TMGB and each TGB.

C. Test equipment grounding conductors for continuity and shorts.

D. Test receptacles for ground connections with devices manufactured for that purpose.

E. Investigate and correct deficiencies.

F. Provide a copy of all test results with closeout documents.

END OF SECTION 26 05 26

SECTION 26 08 00 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

1.2 REFERENCES

A. IECC – International Energy Code

B. NFPA 70 - National Electrical Code.

1.3 SUMMARY

A. Section includes commissioning process requirements for Electrical and Low Voltage Systems

B. Related Sections:

01 Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

C. The cost of the Commissioning Authority shall be paid directly by the Owner.

1.4 GENERAL REQUIREMENTS

A. Test electrical systems and equipment.

B. These tests are required to determine that the equipment involved may be safely energized and operated.

C. Perform tests by and under the supervision of fully experienced and qualified personnel. Advise each respective manufacturer's representative of tests on their equipment.

D. Record all test data.

E. Each section of Division 26 that has products or systems listed herein incorporate this section by reference and is incomplete without the required tests stated herein.

1.5 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority

C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Provide electrical coordination study.

B. Perform commissioning tests at the direction of the CxA.

C. Attend construction phase controls coordination meeting.

D. Provide information requested by the CxA for final commissioning documentation.

E. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.7 CxA'S RESPONSIBILITIES

A. Provide project-specific construction checklists and commissioning process test procedures for actual Electrical Systems, assemblies, equipment and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Provide test data, inspection reports, and certificates in Systems Manual.

1.8 SUBMITTALS

A. Submit test report forms for review a minimum of 90 days prior to requesting a final review by A/E.

B. Furnish six individually bound copies of test data. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken, both prior to and after any corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation.

C. A/E will retain one copy. Remaining copies will be returned to Contractor for inclusion in the operation and maintenance manuals.

PART 2 - MATERIALS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Furnish proposed test procedures, recording forms, list of personnel and test equipment for A/E review.

B. Follow recommended procedures for testing as published by test equipment manufacturer.

3.2 LIGHTING CONTROLS

A. Prior to passing final inspection, the contractor shall perform functional testing in the presence of the registered design professional, the owner and/or their agent. The functional testing shall be as required by section C408.3.1 of the 2021 IECC.

01 The functional testing shall provide evidence that the lighting control systems,

including both hardware and software, are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's instructions.

02 The functional testing shall be in accordance with sections c408.3.1.1 and c408.3.1.2 of the 2021 IECC for the applicable control type.

03 A written report shall be generated documenting the functional testing results in accordance with the 2021 IECC requirements.

B. All lighting controls O&M manuals, as-builts, testing reports and documentation related to the lighting control system shall be provided in their final and approved form within 60 days of the certificate of occupancy. All documents certifying that the installed lighting controls meet documented performance criteria of section C405 of the 2021 IECC shall be included in the O&M manuals.

C. All documents from items #1 and #2 above shall be combined and provided to the owner within 90 days from the date of receipt of the certificate of occupancy.

3.3 ELECTRICAL SWITCHBOARDS AND PANELBOARDS

A. Before Energization:

01 Visually inspect connections for tightness and correctness.

02 Verify proper fusing.

03 Verify adjustable breaker settings match coordination study results.

B. After Energization:

01 Verify proper voltage with system operating at load conditions.

02 Verify proper operation.

03 Operate every circuit breaker, switch and contactor.

04 Modify tap settings on transformers as required.

05 Measure line amperes with system operating at load conditions.

06 Modify circuit breaker and relay settings as required.

07 Megger meter centers for opens, shorts and grounds.

08 Thermographic Tests:

a. With system operating at load conditions, perform thermographic test on switchgear, bus duct, control centers, distribution panelboards, lighting panelboards and equipment feeders using an infrared temperature scanning unit.

b. Tighten or correct connections with higher temperatures than acceptable. After corrections have been made, perform thermograph test to confirm that problems have been corrected.

C. Operate all equipment and control systems through intended sequence. Record all data pertaining to system operation.

01 Contactors

02 Starters

03 Exercise each starter and variable frequency control device through entire operating sequence. Demonstrate that protective features such as phase failure, under-voltage and phase reversal are properly operating.

04 Rotating Equipment:

a. Verify proper voltage and phasing.

b. Modify phasing as required for proper rotation.

c. Measure line amperes (starting and running) and rpm.

d. Demonstrate running of motors and operation of controls and interlocks.

3.4 GROUND FAULT

A. Factory test switchboards at the manufacturer's factory prior to shipment as specified herein:

01 Furnish a ground fault protection system test for circuit testing and verification of the tripping of the ground fault relays at the factory location. Pass predetermined values of current through the relay sensors and measure the relay tripping time for each phase and the neutral sensor (if one is required). Compare the measured time-current relationships to the tri-characteristic curves for each relay. If the relay trips outside the range of values indicated on the curve, replace or recalibrate the relays. Include a polarity verification of the interconnection of the ground sensor circuits as a part of the test.

02 Have the proper voltages applied to their circuits and satisfactory operation demonstrated for additional auxiliary, pilot, control relays, electrically operated breakers, shunt-trip operated breakers, switches, etc.

03 Furnish in accordance with NFPA 70 Section 230-95(c), test results certified by the switchboard manufacturer. One reviewed copy to be available at the job site for review by the authorities having jurisdiction.

04 Upon completion of the factory ground fault protection system tests, the current and time adjustment on each relay are to be set on their minimum values.

B. After construction work is complete and prior to energizing switchboards, field test ground fault protection system; provide reset to manufacturer's recommended setting for both current and time.

01 The test procedure is to be similar to that specified for the factory test.

02 Notify A/E in writing at least two weeks prior to the day of the field test. A/E may witness the field test if he so desires.

03 Furnish all field test results certified by the testing company listed hereinbefore.

3.5 WIRE AND CABLE

A. Test insulation resistance of each building and service feeder after the installation is complete but before the connection is made to its source and point of termination.

B. Test insulation resistance using Biddle Megger or equivalent test instrument at a voltage not less than 1,000 volts DC. Measure resistance from phase-to-phase and phase-to-ground. In circuits where insulation test value is lower than 1 megaohm, remove and replace conductor and retest.

C. Visually inspect connections of every branch circuit for tightness.

D. Ensure that grounding conductor is electrically continuous.

E. Test branch circuits against grounds, shorts or other faults.

F. Inspect grounding and bonding system conductors and connections for tightness and

proper installation.

G. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment.

H. Test the system for stray currents, ground shorts, etc. If stray currents, shorts, etc., are detected, eliminate or correct as required.

3.6 WIRING DEVICES

A. Operate switches at least twice.

B. Test every convenience outlet with plug-in device for proper phasing and grounding.

C. Demonstrate operation of lighting circuits and lighting control systems.

3.7 GROUNDING

A. Test service entrance and separately derived service ground resistance.

01 Provide additional electrodes if resistance is more than 3 ohms.

B. Test telecommunications grounding system per applicable standards.

C. Take corrective measures and retest all failing items.

END OF SECTION 26 08 00

SECTION 26 09 43 - NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 RELATED WORK

A. Section 23 09 23 – Direct Digital Control System for HVAC

B. Section 23 09 93 – Sequence of Operations for HVAC Controls

C. Section 26 27 26 – Wiring Devices

D. Section 26 32 13 – Packaged Generator Assemblies

E. Section 26 36 23 – Automatic Transfer Switch

F. Section 26 55 00 – Theatrical Lighting

G. Section 28 13 00 – Security and Access Control System

H. Section 28 31 00 – Fire Detection and Alarm

1.3 GENERAL REQUIREMENTS

A. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system.

B. Extent of lighting control system work is indicated by drawings and by the requirements of this section. It shall include low voltage switching system with lighting automation relay boxes, associated low voltage switches; fully programmable panel intelligence cards; factory services.

C. Contractor shall provide all quantities for system including but not limited to relays, relay panels, switches, switch plates and plate configuration, wire lengths for both data and switches.

D. Provide complete lighting control system to control all interior lights.

E. All local switching shall be low voltage control type, with one or more switches controlling the lighting in each room.

F. A coordination meeting between the General Contractor, Electrical subcontractor, and the Supplier of the Generator and ATS system shall occur prior to formal submittal.

G. Contractor shall demonstrate the complete successful operation of system including off

site connectivity, emergency transfer, web access, sports lighting and security/site lighting control a minimum of 30 days prior to contract schedule completion date.

H. The lighting controls contractor shall provide the control interface with the local lighting control equipment to tie to the building automation system (BAS). Coordinate with controls contractor for interface type prior to ordering.

I. Interlock lighting control system with other systems as follows:

01 Interlock with fire alarm to enable all lighting upon activation.

02 Interlock with security system:

a. Enable partial lighting when system is first disarmed.

1) Enable 50% of common areas, kitchen, custodial, gang restroom, fine arts, gym, locker room, admin and other areas that may need to be used at times other than student hours.

2) Enable the remaining lights one (1) hour before students arrive until one (1) hour after they leave.

b. Lighting shall be disabled upon arming of the system. Confirm with Owner for time delay between security system arming and lights out.

c. All lighting shall be enabled upon intruder activation.

d. The intent is to have three inputs from the security system: armed, disarmed and activated.

J. Provide multibutton or LCD programmable override switches:

01 Locations are indicated for bidding purposes, confirm locations with Owner/Architect prior to installation:

a. Locate one in main office suite.

b. Locate one in central plant.

02 Master Override Switches:

a. Shall have multiple programmable inputs to the lighting control system.

b. Shall be adjustable in time duration.

c. Shall have engraved wall plates reading “LIGHTING OVERRIDE” and buttons clearly identifying the zone controlled by each switch. For graphical overrides switches, each digital button shall display the zone controlled.

d. Minimum Zones:

1) Interior Corridors

2) Gyms

3) Cafeteria

4) Library

5) Exterior Canopies

6) Exterior Wall Lights

7) Exterior Pole Lights

e. Override of interior lighting zones shall be on only.

f. Override of exterior lighting zones shall be on/off.

K. Where the lighting control system is identified as installable as a **Class 1** system, all line voltage and 0-10V dimming wiring shall be installed as **Class 1** wiring.

1.4 INTRODUCTION

A. The work covered in this section is subject to all of the requirements in the General Conditions of the Specifications. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system. Contractor shall provide to the manufacturer all quantities for system including but not limited to relays, relay panels, switches, switch plates and plate configuration, wire lengths for both data and switches. Contractor shall demonstrate to the Owner, the complete successful operation of system including off site connectivity, emergency transfer, web access, sports lighting and security/site lighting control a minimum of 30 days prior to contract schedule completion date. Installing electrical contractor shall replace any failed warranty material during warranty period of one year.

1.5 SYSTEM DESCRIPTION

A. Extent of lighting control system work is indicated by drawings and by the requirements of this section. It is defined to include, but not by way of limitation:

01 Digital Room Controllers – Self-configuring, digitally addressable one, two or three relays controllers with integral current thyristor, 0-10-volt control for ballasts (if applicable) and single relay application-specific plug load controllers.

02 Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

03 Digital Switches – Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.

04 Digital Photo sensors – Single-zone closed loop and multi-zone open loop daylighting sensors with two-way active infrared (IR) communications can provide switching or dimming control for daylight harvesting.

05 Configuration Tools – Handheld remote for room configuration provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send and receive of room variables and store of occupancy sensor settings. Computer software also customizes room settings.

a. Provide quantity as indicated in 260010 Closeout Requirements.

06 Handheld Remotes for Personal Control – One-button dimming, two-button on/off, or five-button scene remotes provide control using infrared communications. Remote may be configured in the field to control selected loads or scenes without special tools.

a. Provide quantity as indicated in 260010 Closeout Requirements.

07 Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.

08 Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

1.6 QUALITY ASSURANCE

A. Component Pre-testing: All components and assemblies are to be factory pre-tested and burned in prior to installation.

B. NEC Compliance: Comply with NEC as applicable to electrical wiring work.

C. NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

D. UL Approvals: Remote panels are to be UL listed under UL 916 Energy Management Equipment.

E. FCC Emissions: All assemblies are to be in compliance with FCC emissions Standards specified in Part 15 Subpart J for Class A application.

1.7 SUBMITTALS

A. Submit manufacturer's data on lighting control system and components including shop drawings, detailed point to point wiring diagrams, and floor plans showing occupancy and daylighting sensor locations. Provide typical mounting details for occupancy and daylighting sensors for this application.

B. Reference 260000 General Electrical Requirements for additional information.

1.8 MANUFACTURERS

A. Provide lighting controls as indicated on the drawings using one of the following lighting control systems or equal with prior approval. This specification basis of design is Lighting Integrator Complete Control products from Watt Stopper/Legrand, Santa Clara, CA. Contact CW Lighting 713-690-9320.

01 Equal by Acuity nLight controls shall also be acceptable. Contact Lesco Lighting Controls 713-923-7781.

02 Equal by Intelligent Lighting Controls shall also be acceptable. Contact Peterson Scharck & Associates 713-664-7111.

03 Equal by Cooper Lighting Controls shall also be acceptable. Contact Peterson Scharck & Associates 713-664-7111.

04 Due to the wide range of devices and equipment offered by each manufacturer, the approved equal lighting controls manufacturers list is not intended to indicate that any or all manufacturers listed will have suitable substitutions for the controls devices or equipment specified.

B. Substitutions or pre-bid submittals may be proposed during the bidding process as outlined in the General Electrical Section.

PART 2 - MATERIALS

2.1 LIGHTING CONTROL PANELS

A. Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the components listed

B. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1-8 relays, 1-24 relays and 6 four-pole contactors, or 1-48 relays and 6 four-pole contactors.

C. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.

D. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:

01 Removable, plug-in terminal blocks with screwless connections for all low voltage terminations.

02 Individual terminal block, override pushbutton, and LED status light for each relay.

03 Direct wired switch inputs associated with each relay and group channel shall support two-wire, momentary or maintained contact switches.

04 Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches, digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs, digital IO modules capable of receiving momentary or maintained contact closure inputs, digital photocell modules, and digital occupancy sensors.

05 True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.

06 Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.

07 Group, channel, and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any group of relays can be associated with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override pushbuttons and LED displays for channels 1-9 or a handheld IR programmer for channels 1-99.

08 Relay group status for each channel shall be provided through red LED indicators for groups 1-9 and via BACnet for groups 1-99. Solid red indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.

09 Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:

a. Electrical:

1) 30-amp ballast at 277V

2) 20-amp ballast at 347V

3) 20-amp tungsten at 120V

4) 30 amps resistive at 347V

5) 1.5 HP motor at 120V

6) 14,000-amp short circuit current rating (SCCR) at 347V

7) Relays shall be specifically UL listed for control of plug loads

b. Mechanical:

1) Individually replaceable, ½" KO mounting with removable Class

2 wire harness.

2) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.

3) Dual line and load terminals each support two #14 □ #12 solid or stranded conductors.

4) Tested to 300,000 mechanical on/off cycles.

c. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.

E. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

F. At each panel provide one (1) handheld IR remote permanently mounted to the panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel and ensuring that a handheld programmer is always present at each panel.

G. Lighting control panels shall be WattStopper model LMCP8, LMCP24 or LMCP48 as shown on the plans.

2.2 LIGHTING KEYED SWITCHES: Keyed override switches shall utilize district standard key way locks. Override switch shall be provided under 26 27 26 Wiring Devices and integrated into the lighting controls system.

A. Switch shall be three position, two circuit, momentary contact, type switch with center position off.

B. Captive key assemblies shall not be acceptable.

C. Lighting controls contractor shall coordinate with electrician to integrate keyed override switches into the lighting controls system. Position 1 (UP, CW) shall be on and Position 3 (DOWN, CCW) shall be off.

2.3 SINGLE / DUAL RELAY WALL SWITCH OCCUPANCY SENSORS

A. Type Line Voltage Dual Technology: Dual technology (passive infrared and ultrasonic; passive infrared and microphonic) wall switch occupancy sensor. Furnish the Company's model which suits the electrical system parameters, and accommodates the square-foot coverage and wattage requirement for each area (and type of lighting) controlled; WattStopper DW-100, DW-200, DW-103, DW-203, DSW-100, DSW-200, DW-103, DW-203, DSW-301, DSW-302.

B. Type Low Voltage Dual Techonogy: Dual technology (passive infrared and ultrasonic; passive infrared and microphonic) wall switch occupancy sensor Furnish the Company's model which suits the electrical system parameters, and accommodates the square-foot coverage and wattage requirement for each area (and type of lighting) controlled; WattStopper LMDW-101, LMDW-102.

C. Reference drawings for number, location and switch types.

2.4 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the

Company's system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters. Passive infrared only sensors shall not be used for classroom applications.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:

01 Digital calibration and pushbutton programming for the following variables:

a. Sensitivity – 0-100% in 10% increments

b. Time delay – 1-30 minutes in 1 minute increments

c. Test mode – Five second time delay

d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

e. Walk-through mode

f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photo sensors are included in the DLM local network.

02 One or two RJ-45 port(s) for connection to DLM local network.

03 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

04 Device Status LEDs including:

a. PIR Detection

b. Ultrasonic or Microphonic detection

c. Configuration mode

d. Load binding

05 Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

06 Manual override of controlled loads.

C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. All devices shall be hard wired. No wireless devices shall be permitted.

F. WattStopper product numbers: LMPX, LMDX, LMDC

G. Reference drawings for number, location and device types.

2.5 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration; available in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening. Wall switches shall include the following features:

01 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

02 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch

from the wall.

03 Red configuration LED on each switch that blinks to indicate data transmission.

04 Blue Load/Scene Status LED on each switch button with the following characteristics:

a. Bi-level LED

b. Dim locator level indicates power to switch

c. Bright status level indicates that load or scene is active

05 Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.

B. Two RJ-45 ports for connection to DLM local network.

C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

D. The following switch attributes may be changed or selected using a wireless configuration tool:

01 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

02 Individual button function may be configured to Toggle, On only or Off only.

03 Individual scenes may be locked to prevent unauthorized change.

04 Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.

05 Ramp rate may be adjusted for each dimmer switch.

06 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

E. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMSW-2X0, LMSW-211, LMDM-101.

F. Reference drawings for number, location and switch types.

2.6 ROOM CONTROLLERS AND POWER PACKS

A. Room Controllers and power packs automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers and power packs shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

01 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

02 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.

03 Device Status LEDs to indicate:

a. Data transmission

b. Device has power

c. Status for each load

d. Configuration status

04 Quick installation features including:

a. Standard junction box mounting

b. Quick low voltage connections using standard RJ-45 patch cable

05 Plenum rated

06 Manual override and LED indication for each load

07 Dual voltage (120/277 VAC, 60 Hz)

08 Zero cross circuitry for each load.

B. On/Off/Dimming enhanced Room Controllers shall include:

01 Real time current monitoring

02 One, two or three relay configuration

03 Efficient 250 mA switching power supply

04 Four RJ-45 DLM local network ports.

05 One 0-10-volt analog output per relay for control of compatible ballasts and LED drivers.

06 The following dimming attributes may be changed or selected using a wireless configuration tool:

a. Establish preset level for each load from 0-100%

b. Set high and low trim for each load

c. Set lamp burn in time for each load up to 100 hours

07 Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.

a. One relay configuration only

b. Automatic-ON/OFF configuration

08 WattStopper product numbers: LMRC-101, LMRC-102, LMRC-111, LMRC-112, LMRC-211, LRMC-212, LRMC-213, LMRC-221, LMRC-222, LMPL-201

2.7 DIGITAL PHOTO SENSORS

A. Digital photo sensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photo sensors measure the ambient light in the space and control a single lighting zone. Open loop photo sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Photo sensors shall be interchangeable without the need for rewiring.

B. Digital photo sensors include the following features:

01 An internal photodiode that measures only within the visible spectrum, and has a response curve that closely matches the photonic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.

02 Sensor light level range shall be from 1-10,000 foot-candles (fc).

03 The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).

04 For switching daylight harvesting, the photo sensor shall provide a dead band or a separation between the “ON Set point” and the “OFF Set point” that will prevent the lights from cycling after they turn off.

05 For dimming daylight harvesting, the photo sensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.

06 Optional programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise and lower lighting levels for a selected period of time or cycle of occupancy.

07 Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

08 Red configuration LED that blinks to indicate data transmission.

09 Blue status LED indicates test mode, override mode and load binding.

10 Recessed switch to turn controlled load(s) ON and OFF.

11 One RJ-45 port for connection to DLM local network.

12 An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photo sensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or back box.

C. Closed loop digital photo sensors include the following additional features:

01 An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.

02 Automatic self-calibration, initiated from the photo sensor, a wireless configuration tool or a PC with appropriate software.

03 Automatically establishes set points following self-calibration.

04 A sliding set point control algorithm for dimming daylight harvesting with a “Day Set point” and the “Night Set point” to prevent the lights from cycling.

05 WattStopper Product Number: LMLS-400.

D. Open loop digital photo sensors include the following additional features:

01 An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room.

02 Automatically establishes set points following calibration using a wireless configuration tool or a PC with appropriate software.

03 A proportional control algorithm for dimming daylight harvesting with a “Set point” to be maintained during operation.

04 WattStopper Product Number: LMLS-500.

E. Reference drawings for number, location and types.

2.8 DIGITAL PARTITION INTERFACE

A. Provide a partitioning system for divisible room areas as indicated on the drawings. The system is based on the IR Partition as manufactured by Entertainment Networks, 713-572-4000 and I/O interface by WattStopper

B. System shall provide the following functions:

01 Sense room partition positions via ceiling-mounted modulated active infrared sensors. Mechanical sensors will not be accepted.

02 Each sensor has an integral 5-second timer to insure no false status changes.

03 System allows for total automatic configuration of room systems with no staff intervention.

04 Sensor may be mounted up to three feet from partition track.

05 Install system per manufacturer's recommendations and connect to ancillary systems as required.

C. The LMIO-102 Digital Partition interface automatically coordinates lighting controls in flexible spaces with up to four movable walls equipped with contact closures. It is part of a Digital lighting Management (DLM) system, and can reconfigure connected switches and occupancy sensors.

2.9 WIRED LOW VOLTAGE INPUT MODULE:

A. Ability to switch the module between three operating modes, allowing it to be used as a load control device (Normal use), a partition interface device, or an input for interior or exterior photocells.

B. When set in normal usage, the DLM Input Module shall accept up to 4 separate inputs, either 2-wire maintained or momentary inputs or 24VDC inputs. Additionally, two inputs pairs can be used as a 3-wire input to emulate a dimmer rocker.

C. In normal usage, the 4 inputs can be used to control loads, trigger a scene, send a network group command, or emulate an occupancy action so an occupied/unoccupied message is sent to loads.

D. Input modules can trigger special load scenarios, taking advantage of DLM system's priority based functions such as Force On, Force Off, Shed, Cleaning, Normal/After Hours, and Key Switch functions.

E. Inputs can trigger different load and scene modes for controlled outputs, so loads can toggle status, go on, go off, or toggle dim. Scenes can be set to Recall, Recall/Off, or Scene Off.

F. All listed functionality to be accessible from IR handheld remote or from front end system software. Products that require functions to be set at the device, or that incorporate dip switches to select functions, shall not be allowed.

G. Wattstopper Product Number LMDI-101

2.10 WIRED RS-232 INTERFACE MODULE

A. Ability to communicate with other devices and systems via standard RS-232 wiring.

B. Via a standardized set of host commands, other systems can send messages to the RS-232 Interface and in the connected room they can control loads on and off (taking advantage of optional message parameters to dim over time), set scene, execute button lockout, changing room profiles, Forcing Loads On or Off, or sending out a Normal Hours/After Hours command.

C. By using a “status” command the RS-232 interface module can be instructed to share information with connected systems whenever changes occur in the room. Examples of message alerts include relay status chance, occupancy status change (by room or by sensor), scene status change, buttons are pressed, room profiles chance based on partitions, or daylight levels monitored by an interior photocell change.

D. Wattstopper Product Number LMDI-100

2.11 EMERGENCY LIGHTING

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF 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:

01 120/277 volts, 50/60 Hz., 20-amp ballast rating

02 Push to test button

03 Auxiliary contact for remote test or fire alarm system interface

B. Provide for all emergency lighting on generator or inverter power only.

C. Provide remote test button in ceiling adjacent to emergency lighting fixture.

D. WattStopper Product Numbers: ELCU-100, ELCU-200, EMTS-100.

2.12 ROOM NETWORK (DLM Local Network)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:

01 Plug n’ Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

02 Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

03 Push n’ Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.

04 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

2.13 BACnet® BASED DIGITAL COMMUNICATIONS

A. The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 master/slave token passing-based using the BACnet® protocol.

B. The panel shall have provision for an individual BACnet device ID. The device ID

description property shall be writable via the network to allow unique identification of the lighting control panel on the network.

C. The panel shall support MS/TP MAC addresses in the range of 0-127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second.

D. Lighting control relays shall be controllable as binary output objects in the instance range of 1-64. The state of each relay shall be readable and writable by the BAS via the object present value property.

E. Lighting control relays shall report their true on/off state as binary input objects in the instance range of -64.

F. The 99 channel groups associated with the panel shall be represented by binary value objects in the instance range of 201-299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the afterhours mode.

G. Setup and commissioning of the panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:

01 Binary output objects in the instance range of 1-64 (one per relay) for on/off control of relays.

02 Binary value objects in the instance range of 1-99 (one per channel) for normal hours/after hours schedule control.

03 Binary input objects in the instance range of 1-64 (one per relay) for reading true on/off state of the relays.

04 Analog value objects in the instance range of 1-64 (one per relay) shall assign relays to channel groups in the range of 1 - 99.

05 Analog value objects in the instance range of 101-199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.

06 Analog value objects in the instance range of 201-299 (one per channel) shall assign an after-hours time delay value to the channel in the range of 1-240 minutes.

07 Multi-state value objects in the instance range of 1-99 (one per channel) shall provide the state of the relays assigned to the channel. Valid states shall be ALL ON, MIXED, BLINK, and ALL OFF.

H. The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.

I. The BO and BV 1-99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa. (http://www.bacnet.org/Addenda/Add-135-2010aa.pdf)

J. Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object.

K. Lockout of all digital switch buttons connected to a given panel shall be command-able

via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196.

L. Lighting control accessory devices connected to the panel shall be represented via BACnet objects including but not limited to the following:

01 Digital occupancy sensor detection states shall be readable as BI objects ranging from BI1-96.

02 Digital occupancy sensor configuration parameters shall each be accessible as BACnet objects when applicable to a given product.

a. Occupancy sensor time delay in minutes shall be writeable via AV101-196.

b. Occupancy sensor passive infrared (PIR) sensitivity percentage shall be writeable via AV201-296.

c. Occupancy sensor ultrasonic (US) sensitivity percentage shall be writeable via AV301-396.

03 Digital switch buttons shall be readable and writeable as BI objects ranging from BI101 – 9608.

04 Digital daylight sensors foot-candle readings shall be readable as follows:

a. Analog 0-5V/0-10V sensors connected to a digital input module shall be represented as AI1-96.

b. Digital closed loop sensors shall be represented as AI4001-4096.

c. Digital open loop sensors shall be represented as AI5001-5096.

d. Digital dual loop sensors shall be represented as follows:

1) The upward facing open loop sensor shall be represented as AI6001-6096.

2) The downward facing closed loop sensor shall be represented as AI6101-6196.

05 Digital daylight sensor configuration shall be exposed as BACnet objects as follows:

a. Digital closed loop sensors shall be represented as follows:

1) Daylight Sensor Day Set point (ftcd) AV4201-4296.

2) Daylight Sensor Night Set point (ftcd) AV4301-4396.

3) Daylight Sensor Off Set Point Delay (minutes) AV4401-4496.

4) Daylight Sensor On Set point (ftcd) AV4501-4596.

5) Daylight Sensor Off Set point (ftcd) AV4601-4696.

2.14 USER INTERFACE

A. Each lighting control panel system shall be supplied with minimum quantity of loose handheld IR remote programming interfaces consisting of a keypad and associated OLED display screen as indicated in 260010 Closeout Requirements. The user interface shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following functions as a minimum:

B. Set network parameters including panel device ID, MS/TP MAC address, baud rate and

max master range.

C. Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.

D. Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.

E. Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.

F. Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.

G. Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.

H. An additional handheld IR remote shall be permanently mounted to each panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel while assuring that the handheld programmer is always present at that panel. An unlimited number of handheld IR remotes may also be purchased for facilities staff as seen fit by the end user's representative.

2.15 CONFIGURATIONS TOOLS

A. Each lighting control system shall be supplied with minimum quantity of configuration tools as indicated in 260010 Closeout Requirements. A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include:

01 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.

02 High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.

03 Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.

04 Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.

05 Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting.

06 Adjust or fine-tune daylighting settings established during auto-commissioning, and input light level data to complete commissioning of open loop daylighting controls.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

PART 3 - EXECUTION

3.1 INSTALLATION

A. Contractor shall provide to the manufacturer all quantities for system including but not limited to relays, room controllers, relay panels, plug load controllers, switches, sensors and wire lengths and configurations for both network and device cable at least 1 week before bid.

B. When using wire for connections other than the DLM local network (Cat 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements

C. All MSTP network and Cat 5e low voltage wiring must have the manufacturer printed on the wire jacket. Any cable substitutions shall be removed and replaced at the contractor's expense.

D. All MSTP network terminations shall utilize wire ferrules for terminations and MSTP network manufacturer's instructions. Any network deficiencies shall be repaired at the contractor's expense.

E. Electrical contractor must provide a detailed as-built plan in CAD showing MSTP network cable routing and network bridge serial numbers to the manufacturer at least 2 weeks prior to factory commissioning Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.

F. Electrical contractor shall be responsible for scheduling the following onsite coordination meetings through the duration of the project. Attendance shall be required for the GC, EC, representative from MEP firm, BAS Integrator and lighting control rep.

01 Pre-Installation- After submittals have been approved and material has arrived onsite and before installation of any devices begins. Review lighting control layout plans, required as-built information and MSTP Terminations.

02 Pre-Factory startup- Electrical contractor must have all lighting control devices installed, wired and tested at least 30 days prior to substantial completion deadline. At this coordination meeting the electrical contractor shall walk the site with attendees and go room by room to ensure they are ready for factory technician to start the system programming. Electrical contractor shall have his as built documentation of the system completed for this meeting.

03 Move in: 30 days prior to owner move in all parties shall meet onsite to review completed system. At this time all installation and factory programming shall be completed.

G. The installing electrical contractor shall complete, prior to request of factory start up and site commissioning, complete installation of all relay panels, room controllers, power packs, their respective loads landed and confirmed operations, switches installed, and confirmed operational, and the entire data network shall be pulled from all panels to the designated IT room as indicated on plans.

H. The installing contractor shall, prior to request of factory start up and site commissioning, request a site visit by the local authorized factory rep to assist in identification of any open ended issues, thereby eliminating potential for delays and system commission interruptions. The pre commissioning meeting shall include the Engineer, the Architect, the local rep, the Owner's project manager, the Owner's energy manager, the electrical contractor and the general contractor

I. Upon confirmation of progress by local factory authorities, the installing electrical contractor will complete the factory startup request form, including any relay/circuit, and switching changes from the contract documents. This is essential to facilitate substantial

completion.

J. Labels:

01 The installing electrical contractor shall clearly label all low voltage wiring inside the relay controllers. Labels shall be typed and indicate what they are connected to (switch, occupancy sensor, etc..) and what room they are connected to. Labels shall be Panduit Permanent Labels or Brother Cable Labels. The room # shall include both the architectural plan room numbers as well as the room numbers to be shown on the signage.

02 The installing electrical contractor shall clearly label all network lighting relay controllers, segment managers and network bridges with line voltage circuits. Labels shall be typed and indicate what panel, voltage and circuit they are connected to. Labels shall be Panduit Permanent Labels or Brother Cable Labels.

03 Relay Panel and Enclosure Field Nameplates: Provide lamacoid nameplate with 5/16" letters on front face showing panel name, voltages contained and circuits nubmers. Attach with mastic and two screws. Coordinate to give same name as shown on panelboard schedule.

Relay Panel RA

277V

HA-1,3,5,6,9

K. All low voltage wiring inside the relay controllers must be clean and organized. Wire nuts are not acceptable, only compression fittings.

L. Low voltage wire shall be terminated so the wire jackets match the color coding on the termination blocks.

3.2 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 260010 Closeout Requirements.

B. The contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion as attic stock. No devices shall be used without documentation and written authorization from the Owner's representative.

C. Unused items shall be turned over to the owner within thirty (30) days of substantial completion of the project. Unused material is to be ordered separately when commissioning is scheduled in order to ensure the longest warranty period possible.

D. Contractor shall obtain a signed transmittal of equipment turned over to the owner at the end of the project. The signed transmittal shall be included in the contractor's closeout documents.

3.3 SUPPORT SERVICES

A. System Start Up and Commissioning

01 Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components. The startup requirement is intended to verify:

a. That all occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory and the contract documents.

b. The occupancy sensors and daylighting sensors are operating within the manufacturers specifications.

c. The sensors and room controllers interact as a complete and operational system to meet the design intent.

02 Manufacturer to provide a written statement verifying that the system meets the above requirements.

03 The electrical contractor shall request factory commissioning by submitting a startup request form at least (2) weeks before startup is required.

04 Electrical contractor must schedule lighting control factory start-up to begin at least four (4) weeks prior to substantial completion deadline.

05 Lighting control technician shall issue daily reports notifying of the project status, open issues, challenges, etc. at the end of each day he/she is onsite commissioning the system. Reports shall be sent directly to EC, GC and Architect/Engineer.

06 At the completion of the first visit of the lighting control technician, all parties shall meet onsite to walk the project and evaluate any open issues. At this meeting the schedule for owner training shall be determined.

07 The electrical contractor shall provide at least (1) journeyman electrician, familiar with the installation of the system, dedicated to assisting the factory start-up technician for the entire duration of the commissioning process.

B. System Training

01 Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and daylighting controls.

a. Reference 260010 Closeout Requirements.

02 Owner operation memo- Lighting control manufacturer shall prepare an operational memo for owner to distribute informing building occupants of the operation of their lighting control system. Memo shall explain the following but not limited to:

a. auto on/ vs manual on

b. occupancy sensors

c. daylight harvesting

d. plug load control

e. after hours time delays

f. additional systems operations components based on the system design

C. System Programming

01 Manufacturer shall provide system programming including:

a. Wiring documentation.

b. Switch operation.

c. Occupancy sensors.

d. Photocells

02 Verification of a complete and working system including MSTP network status

03 Provide computer generated documentation on the commissioning of the system including a room by room description of:

a. Sensor Parameters, time delays, sensitivities and daylighting set points.

b. Sequence of operation (e.g. manual on, auto off, etc.)

c. Load Parameters (e.g. blink warning, etc.)

3.4 CLOSEOUT DOCUMENTATION

A. Reference 260010 Closeout Requirements.

3.5 RE-COMMISSIONING

A. Reference 260010 Closeout Requirements.

3.6 WARRANTY

A. Reference 260010 Closeout Requirements.

END OF SECTION 26 09 43

SECTION 26 22 13 - LOW VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

PART 2 - MATERIALS

2.1 STANDARD DRY TYPE TRANSFORMERS

A. GENERAL: Provide U. L. labeled, plated copper or aluminum wound, two winding type units, NEMA 3R construction suitable for location installed. Provide NEMA 3R construction for all transformers installed under piping. Refer to Drawings for ratings. All products shall be manufactured in North America and shall meet or exceed latest DOE standards.

B. TEMPERATURE RISE: Design shall use 220° C insulation and operate with a maximum temperature rise of 150° 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 not be more than NEMA and ANSI Standards.

01 Provide low noise option for sensitive environments with minimum 3dB reduction in sound levels below ST-20 requirements.

E. MANUFACTURERS: GE Industrial (ABB), Acme, Hammond, Square D, and Siemens

2.2 HARMONIC MITIGATING TRANSFORMERS

A. GENERAL: Provide three phase common core, copper wound, two winding type units, NEMA 12 construction suitable for location installed. All products shall be manufactured in North America and shall meet or exceed latest DOE standards.

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.

C. TAPS: High voltage windings shall be provided with two 2½% taps FCAN and four 2½% taps FCBN.

D. TEMPERATURE RISE: Design shall use 220° C insulation and operate with a maximum temperature rise of 115° C above a 40° C ambient.

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 not be more than NEMA and ANSI Standards.

01 Provide extra low noise option for sensitive environments with minimum 5dB reduction in sound levels below ST-20 requirements.

F. MANUFACTURERS: Powersmiths T1000-OPAL, GE Industrial (ABB), Square D, and Siemens.

2.3 ADJUSTABLE BREAKERS

A. LARGE TRANSFORMERS: Provide adjustable type breakers for overcurrent protection of all low voltage transformers 112.5kVA and larger.

B. COORDINATION STUDY: Provide an electrical coordination study to determine settings of adjustable circuit breakers to match equipment served. Include revised setting of adjustable circuit breakers during the warranty period required to eliminate nuisance tripping. Provide copy of the coordination study with closeout documents.

2.4 IDENTIFICATION

A. Provide 2.25” x 4” lamacoid master nameplate on front face of the transformer with ½” high engraved letters for equipment name and ¼” high letters for system information and mounting holes. Provide black background with white letters for standard panels and red background with white letters for emergency and standby panels. Attach with mastic and two screws. Coordinate to give same transformer characteristics and upstream connection name as shown on drawings. Example:

TRANSFORMER XA 480V-208Y/120 VOLTS, 3 PHASE, 4 WIRE 45 KVA, K=13 FED FROM PANEL DA

END OF SECTION 26 22 13

SECTION 26 24 00 - SWITCHBOARD AND PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26 apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 ABBREVIATIONS

A.	TVSS	Transient Voltage and Surge Suppressor
B.	SPD	Surge Protection Devices
C.	EGF	Equipment Ground Fault, 30mA equipment protection.
D.	GFI or GFCI	Ground Fault Circuit Interruption, 5mA personnel protection.

PART 2 - MATERIALS AND METHODS

2.1 SWITCHBOARDS

A. GENERAL: Universal building type switchboard fabricated in accordance with NEMA standards. Switchboards and circuit breakers shall be listed for use with 75° C wiring. All products shall be manufactured in the United States.

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 silver plated copper and of sufficient cross-sectional area to continuously conduct rated full load current with a maximum average temperature rise of 65° C, above an ambient temperature of 40°C. The main horizontal buss bars between sections shall be located on the back of the switchboard to permit a maximum of available conduit area. The horizontal main buss 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 buss bars for future extension both directions. Provide a full length copper ground buss in each cubicle. Provide a full length copper ground buss 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 is capable of withstanding 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. Reference drawings for short circuit analysis and required equipment ratings.

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 Square D I-Limiter type. Circuit breakers 1000A and larger shall be Square D Type SE with LSG trip. Manufacturer shall provide system coordination study with recommended settings to ensure downstream circuit breakers will operate before distribution breakers. Provide study after main feeder length information is provided by the electrical contractor.

01 Provide circuit breakers with integral metering as indicated on the drawings. Where provided with integral metering the switchboard shall be equipmed with a Modbus TCP interface for integration into the building automation system.

F. SUPPRESSORS: Provide equipment mounted lighting surge suppresser with capacitor from same manufacturer as the switchboard equipment with dry contacts and surge counter. Equipment shall be mounted in the switchboard. See SPD section within this specification for more information.

G. ARC ENERGY REDUCTION EQUIPMENT: Provide an energy-reducing maintenance (RELT) switch with local status indicator with all electrical equipment containing circuit breakers rated for or where the highest continuous current trip setting can be adjusted to 1200A or higher per NEC requirements. All documentation on the design, installation and operation of the RELT switch shall be included in O&M documentation.

H. INSTRUMENTATION:

01 Provide circuit breakers with integral metering and output to the building control system as detailed within the drawings and these specifications.

02 Provide an externally mounted metering solution as detailed within the drawings and these specifications.

I. NAME TAGS:

01 Field Nameplate: Provide 2.25” x 4” lamacoid master nameplate on front face of the panel with ½” high engraved letters for equipment name and ¼” high letters for system information and mounting holes. Provide black background with white letters. Attach with mastic and two screws. Replace the below information to match the project design.

SWITCHBOARD MSB 480Y/277V, 3ϕ, 4W MAIN BUSS: 2500 AMPS BRACED FOR XX,XXX AMPS SYMMETRICAL AVAILABLE SHORT CIRCUIT CURRENT: XX,XXX AMPS DATE INSTALLED: XX/XX/XXXX

02 Circuit Nameplate: For each circuit provide engraved lamacoid nameplates (5/16" high letters) showing equipment served, trip setting, and frame size if a fused switch or adjustable trip type breaker. Attach nameplates with mastic and two sheet metal screws. For spaces indicate maximum size circuit breaker that can be installed. Examples:

PANEL HA 225A/3P

SPARE 400A/3P

400A/3P SPACE

03 Identification of ungrounded conductors: Provide permanent label indicating the color coding of phase conductors based on voltage as noted in 260500 COMMON WORK RESULTS FOR ELECTRICAL.

K. SIGNS

If there is an emergency generator installed provide the following signs at the main service switchboard:

AN EMERGENCY GENERATOR IS INSTALLED AT THIS SITE.

L. ACCEPTABLE MANUFACTURERS: GE Industrial (ABB), Siemens and Square D.

2.2 DISTRIBUTION PANELS

A. GENERAL: Provide for panels 600 amps and larger or where indicated on the drawings. Construction in accordance with NEMA standards. Panels and circuit breakers shall be listed for use with 75° C wiring. All products shall be manufactured in the United States.

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: Buss 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 buss bar not to exceed 50° C rise above ambient. Heat rise tests shall be conducted in accordance with Underwriters' Laboratories Standard UL 67. Busses shall be tin silver plated copper braced for the scheduled fault current (50,000 amperes minimum). Provide copper ground and neutral bars including 200% neutral and isolated ground kits as indicated on the drawings Bussing shall accept the largest circuit breaker available for the ampacity scheduled even though only smaller size CB's are listed. Where space only is shown, bussing shall allow any combination of 1, 2 and 3 pole circuit breakers of various frame sizes.

D. CIRCUIT BREAKERS: Circuit breakers shall bolt in or have 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. Minimum 18,000 amperes interrupting capacity for circuit breakers 100A and larger.

E. ARC ENERGY REDUCTION EQUIPMENT: Provide an energy-reducing maintenance (RELT) switch with local status indicator with all electrical equipment containing circuit breakers rated for or where the highest continuous current trip setting can be adjusted to 1200A or higher per NEC requirements. All documentation on the design, installation and

operation of the RELT switch shall be included in O&M documentation.

F. SURGE SUPPRESSION: Panels noted to have SPD surge suppression shall include SPD mounted inside panel. See SPD section within this specification for more information.

G. INSTRUMENTATION: Provide an externally mounted sub-metering solution as detailed within the drawings and these specifications.

H. NAMEPLATES

01 Factory Nameplate: Provide information per industry standards but shall include voltage, phase, buss amperage and short circuit rating.

02 Field Nameplate: Provide 2.25” x 4” lamacoid master nameplate on front face of the panel with ½” high engraved letters for equipment name and ¼” high letters for system information and mounting holes. Provide black background with white letters for standard panels and red background with white letters for emergency and standby panels. Attach with mastic and two screws. Coordinate to give same name as shown on panelboard schedule. If used as main service panel provide short circuit available and rating information.

PANEL DA 480Y/277V, 3ϕ, 4W 800A MLO FED FROM SWITCHBOARD MSB

03 Circuit Nameplate: For each circuit, spare breaker, and empty space provide engraved lamacoid nameplates (5/16" high letters) showing equipment served, trip setting, and frame size if an adjustable trip type breaker. Attach nameplates with mastic and two sheet metal screws. For spaces indicate maximum size circuit breaker that can be installed. Examples:

PANEL HA 225A/3P

SPARE 400A/3P

400A/3P SPACE

04 Short Circuit Nameplate: A permanently affixed label shall be attached to all new electrical equipment with the available fault current at the time of installation and calculation. The label shall be minimum 2” x 3” in size and shall be blue lettering on a contrasting background. The label shall also include the date of the calculation. Refer to drawings and equipment short circuit analysis table.

05 Identification of ungrounded conductors: Provide permanent label indicating the color coding of phase conductors based on voltage as noted in 260500 COMMON WORK RESULTS FOR ELECTRICAL.

I. ACCEPTABLE MANUFACTURERS: GE Industrial (ABB), Siemens and Square D.

2.3 BRANCH CIRCUIT PANELBOARDS

A. GENERAL: Provide for panels 400 amps and smaller. Circuit breaker type; 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. All products shall be manufactured in the United States.

B. CABINETS:

01 Panels located in mechanical and electrical rooms: 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-in-door construction with both inner door and outer door with flush type lock and latch, all keyed alike.

02 Panels located in kitchens: Safety dead front type with stainless steel front trim and quarter turn fasteners; box made of code gage galvanized steel; provide wire bending space per NEC Table 373-6; single door construction with flush type lock and latch.

03 Panels located in classrooms, storage rooms, and finished and similar spaces with access by non-maintenance staff: 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; single door construction with flush type lock and latch.

04 All panelboards with 60 or more circuits in a single section shall be 30” wide with extra wire bending space.

C. CIRCUIT BREAKERS: Plug in or bolt in for 120/208-240 Volts, bolt in only 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 22,000 Amps minimum and be vertically mounted. Ratings as scheduled on drawings. 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 buss connectors and all other provisions necessary to add future breakers of any size and number of poles up to 100 amps and three poles.

D. BUSSING: Tin 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. Provide copper ground and neutral bars including 200% neutral and isolated ground kits as indicated on the drawings. Lugs U. L. rated for Cu/Al terminations. Unless indicated otherwise on drawings, buss bracing shall be 22,000 Amps symmetrical. Panels with 24 or more circuits shall have a minimum of 225 Amp bussing. Provide a ground bar in the Service Entrance Equipment and in each electrical panel having a branch circuit ground wire.

E. SURGE SUPPRESSION: Panels noted to have integral SPD surge suppression shall include SPD mounted inside panel. See SPD section within this specification for more information. The surge suppress device shall not use any of the scheduled spaces. Provide additional bussing and larger can to accommodate the surge suppression device.

F. INSTRUMENTATION: Provide an externally mounted sub-metering solution as detailed within the drawings and these specifications.

G. DIRECTORY: Complete at end of job, typewritten, stating equipment or rooms served by circuit. Type even circuits on right side of card, odd on left side. Provide laminated directory for exterior or wet locations.

H. 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.

I. NAMEPLATES

01 Factory Nameplate: Provide information per industry standards but shall include voltage, phase, buss amperage and short circuit rating.

02 Circuit Number Labels: All circuits and spaces shall be clearly labeled on the

panel dead front with the typed circuit number labeling provided by the equipment manufacturer. Circuit numbers shall be attached adjacent to each circuit breaker and space on the panel, even circuits on right side, odd on left.

03 Field Nameplate: Provide 2.25" x 4" lamacoid master nameplate on front face of the panel with ½" high engraved letters for equipment name and ¼" high letters for system information and mounting holes. Provide black background with white letters for standard panels and red background with white letters for emergency and standby panels. Attach with mastic and two screws. Coordinate to give same name as shown on panelboard schedule. If used as main service panel provide short circuit available and rating information.

PANEL HA 480Y/277V, 3ϕ, 4W 225A MLO FED FROM PANEL DA

04 Short Circuit Nameplate: A permanently affixed label shall be attached to all new electrical equipment with the available fault current at the time of installation and calculation. The label shall be minimum 2" x 3" in size and shall be blue lettering on a contrasting background. The label shall also include the date of the calculation. Refer to drawings and equipment short circuit analysis table.

05 Identification of ungrounded conductors: Provide permanent label indicating the color coding of phase conductors based on voltage as noted in 260500 COMMON WORK RESULTS FOR ELECTRICAL.

J. ACCEPTABLE MANUFACTURERS: GE Industrial (ABB), Siemens and Square D.

2.4 TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS/SPD)

A. GENERAL: Provide SPD equipment for electrical panels and equipment as noted on the Drawings. Equipment may be noted to have SPD integral or external to the panel or switchboard.

B. INSTALLATION:

01 Integral SPD shall be installed and mounted within the equipment to be protected. Provide a three pole circuit breaker in the panel or direct bus connection. Connect SPD with wiring as short and straight as possible. The integral SPD shall not take any of the spaces shown on the panel schedule.

02 External SPD shall be installed in NEMA 1 housing and mounted adjacent to the equipment to be protected. Provide NEMA 4X housing in the central plant, boiler rooms and exterior locations. Provide a three pole circuit breaker in the panel or direct bus connection with integral OCPD and disconnect within SPD cabinet. Connect SPD with wiring as short and straight as possible.

C. DISPLAY: Provide LED status indicators and digital transient counter with battery backup.

D. ALARM: Provide audible alarm with silence and test function.

E. SUPPRESSION MODES: System shall provide suppression of L-L, L-N, L-G and N-G transients.

F. RESPONSE TIME: 1 nanosecond or less.

G. EMI/RFI ATTENUATION: 38 dB or better.

H. MONITORING: Provide remote monitoring contacts, dry, 1 form C type, rated for 120V,

1A (30A VDC, 2A).

I. WARRANTY: 10 year, non-prorated replacement.

J. MINIMUM SPD RATING:

01	Panels smaller than 400 amps:	100 kAmps per phase
02	Panels 400 amps up to 800 amps:	150 kAmps per phase
03	Panels 801 amps up to 2000 amps:	240 kAmps per phase
04	Panels greater than 2000A:	400 kAmps per phase

05 Reference drawings for scheduled SPD ratings which may exceed the minimum values indicated here.

K. ACCEPTABLE MANUFACTURERS: GE Industrial (ABB), Siemens, and Square D matching equipment manufacturer.

2.5 ADJUSTABLE CIRCUIT BREAKERS

A. COORDINATION STUDY: Provide an electrical coordination study to determine settings of all adjustable circuit breakers to match equipment served. Include revised setting of adjustable circuit breakers during the warranty period required to eliminate nuisance tripping. Provide copy of the coordination study with closeout documents.

B. LARGE TRANSFORMERS: Provide adjustable type breakers for overcurrent protection of all low voltage transformers 112.5kVA and larger.

C. LARGE MOTORS AND EQUIPMENT: Circuit breakers serving 50 hp and larger motors, or large equipment such as chillers shall be adjustable type coordinated with the starting requirements of the equipment.

2.6 SPECIAL EQUIPMENT LABELING AND DEVICES

A. FIRE ALARM SYSTEM:

01 Provide red circuit lockout device on all circuit breakers serving fire alarm equipment and devices. Coordinate with fire alarm contractor for any circuits added per their design for power supplies, amplifiers, etc.

02 Provide typewritten label with white letters on a contrasting red background reading “FA” permanently attached to the panel dead front adjacent to each breaker.

03 Provide typewritten label with white letters on a contrasting red background permanently attached to the outside of the panel cover reading ‘FIRE ALARM CIRCUIT INSIDE” or similar.

04 Space Age Electronics ELOCK-FA E-Series Lockout Kit or equal. Confirm kit is compatible with provided electrical equipment prior to ordering.

B. BUILDING AUTOMATION SYSTEM (BAS):

01 Provide blue circuit lockout device on all circuit breakers serving BAS equipment and devices.

02 Provide typewritten label with white letters on a contrasting blue background reading “BAS” permanently attached to the panel dead front adjacent to each breaker.

a. Where each BAS panel is named the label shall include the panel name.

For example “BAS 2-A” for panel 2-A. Panel names shall match as-built conditions.

03 Garvin UBL1-BLU Blue Universal Breaker Lock Out Device or equal. Confirm devices are compatible with provided electrical equipment prior to ordering.

C. BUILDING NETWORK EQUIPMENT:

01 Provide typewritten label with white letters on a contrasting blue background reading “DATA” permanently attached to the panel dead front adjacent to each breaker.

D. INSTALLATION: Install lockout devices and labels at the end of the job, prior to substantial completion. Labels shall be installed on the opposite side from the electrical equipment manufacturer’s circuit number labels and square to the housing.

2.7 COORDINATION STUDY

A. Provide a complete electrical coordination study of the electrical distribution system.

01 Short circuit values shall use the ultimate available short circuit current values as identified by the power company.

02 Arc fault study shall use the initial/current power company service values.

03 Provide short circuit and arc fault labels on all new electrical equipment.

B. BREAKER SELECTIONS:

01 Use the study results to determine settings of adjustable circuit breakers and selections/ratings of non-adjustable circuit breakers or fuses so the entire system is coordinate including downstream circuit breakers in other equipment. Include revised setting of adjustable circuit breakers during the warranty period required to eliminate nuisance tripping.

02 Include all systems such as generators, automatic transfer switches, relay panels, etc. in the coordination study and OCP selection process.

C. Provide copy of the coordination study with closeout documents.

D. Provide letter with closeout documents from the manufacturer/certified installer verifying that all breakers have been set complying with the approved coordination study.

END OF SECTION 26 24 00

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

PART 2 - MATERIALS AND METHODS

2.1 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 installed with the ground pin down. Devices installed in or served through fire rated structures shall be fireproofed in a manner compatible with the U. L. fire rating.

01 ACCEPTABLE MANUFACTURERS: Catalog numbers listed below are Hubbell or Legrand (Pass & Seymour), unless indicated otherwise. Equivalent items made by Arrow-Hart, Bryant, Hubbell, Legrand, Leviton, and Lutron will be acceptable provided they meet specification requirements. Each type of wiring device and associated wall plate shall be from a single manufacturer.

02 DEVICE COLORS:

a. Typical devices shall be white color unless noted otherwise.

1) Devices on a generator shall be red.

2) Computer/isolated ground outlets shall be orange.

3) Devices on or adjacent to stages shall have their finish selected by the Architect.

b. Typical device faceplates shall be stainless steel unless noted otherwise.

1) Devices on or adjacent to stages shall have their finish selected by the Architect. Provide custom metal wall plate with finish matching installed device.

03 WIRING TYPES:

a. Side wire or plug tail devices.

b. Backstab devices are NOT acceptable.

04 COORDINATION:

a. Receptacles for Owner-Furnished Equipment: Match plug configurations.

b. Cord and Plug Sets: Match equipment requirements.

05 LABELING:

a. Provide printed, clear, adhesive label, with one (1) inch, BLACK text identifying panel and circuit on each device face plate.

b. Label shall be in HA-XX format where HA is the panel name and XX is the circuit number.

B. WALL TOGGLE SWITCHES: (20 Amp/277 Volt)

01 Industrial Extra Heavy Duty: Hubbell HBL1221, Legrand PS20AC1, Leviton 1221 or matching 2-pole, 3-way and 4-way switches.

C. MOMENTARY WALL TOGGLE SWITCHES: (20 Amp/277 Volt)

01 Switch shall be three position, two circuit, momentary contact, type switch with center position off.

02 Electrician shall coordinate with the lighting controls or BAS contractors as applicable to integrate momentary keyed switches into the lighting controls system. Position 1 (UP) shall be on and Position 3 (DOWN) shall be off.

03 Industrial Extra Heavy Duty: Hubbell HBL1557, Legrand, or Leviton 1257

D. KEYED SWITCHES: (20 Amp/277 Volt).

01 HBL1221L (Hubbell only) or matching 2-pole, 3-way and 4-way switches with 1209 key with each switch.

02 Provide sample of and confirm device and matching key type with Owner prior to ordering

E. MOMENTARY KEYED SWITCHES: (20 Amp/277 Volt)

01 Switch shall be three position, two circuit, momentary contact, type switch with center position off.

02 Captive key assemblies shall not be acceptable.

03 Electrician shall coordinate with the lighting controls or BAS contractors as applicable to integrate momentary keyed switches into the lighting controls system. Position 1 (UP) shall be on and Position 3 (DOWN) shall be off.

04 HBL1557L (Hubbell only) with 1209 key with each switch.

F. SWITCH WITH LIGHT: (20 Amp/277 Volt, Clear) Hubbell HBL1221ILC, Legrand PS20AC1-CSL

G. MOTOR RATED SWITCH:

01 (20 amp, 277V) P&S PS20AC1

02 (20 amp, 120/277V, Double Pole) P&S PS20AC2 or Hubbell HBL7832D.

03 (30 Amp, 120/277V, Double Pole) P&S PS30AC2 or Hubbell HBL7832D.

04 (30 Amp, 120/277V, Three Pole) P&S 7803MD or Hubbell HBL7810D.

05 All switches shall have minimum rating of upstream overcurrent protection.

06 Where switches are used as disconnecting means the switch shall be lockable in accordance with NEC (2023) 110.25. Provide integral locking tabs on enclosure or lockable switch bracket mounted to the device plate. P&S 7801-P or equal.

H. MOTOR RATED SWITCH WITH PILOT LIGHT:

01 (20 amp, 277V, Red) Hubbell HBL1221PL, P&S PS20AC1-RPL7, Leviton 1221-7PR or matching 3-way switch.

02 (20 amp, 120/277V, Double Pole, Red) Hubbell HBL1222PL, P&S PS20AC2-RPL, Leviton 1222-7PR

03 (30 Amp, 120V, Single, Red) Hubbell HBL3031PL, P&S PS30AC1-RPL, Leviton 3031-PLR or matching 3-way switch.

04 (30 Amp, 277V, Single, Red) Hubbell HBL3031PL

05 (30 Amp, 120/277V, Double Pole, Red) Hubbell HBL3032PL, P&S PS30AC2-RPL

06 All switches shall have minimum rating of upstream overcurrent protection.

07 Where switches are used as disconnecting means the switch shall be lockable in accordance with NEC (2023) 110.25. Provide integral locking tabs on enclosure or lockable switch bracket mounted to the device plate. P&S 7801-P or equal.

I. MANUAL MOTOR STARTER WITH THERMAL OVERLOAD AND PILOT LIGHT.

01 All switches shall have minimum rating of upstream overcurrent protection.

02 All switches shall have red pilot light integral to the switch cover.

03 All switches shall have an integral thermal overload unit to protect downstream devices. Coordinate thermal overload unit with device to be protected.

04 Where switches are used as disconnecting means the switch shall be lockable in accordance with NEC (2023) 110.25. Provide integral locking tabs on enclosure or lockable switch bracket mounted to the device plate. P&S 7801-P or equal.

05 Acceptable manufacturers: Square D FG Series or equal by GE Industrial (ABB), Siemens, or Eaton.

J. CONVENIENCE OUTLETS: (20 amp/125v/3 wire)

01 Industrial, Extra Heavy-Duty, Tamper-Resistant:

a. Duplex: Hubbell HBL5362TR, Legrand TR5362, Leviton 5362-SG.

b. Simplex: Hubbell SNAP5361TR

02 All outlets in kitchens, concession stands and similar spaces must be tamper resistant and weather resistant:

a. Hubbell BR20WRTRx, Legrand WR20TRx or approved equal.

K. ISOLATED GROUND/COMPUTER OUTLETS: (20 amp/125v/3 wire)

01 Industrial, Extra Heavy-Duty, Finder Groove, Tamper-Resistant & Isolated Ground:

a. Legrand TRIG5362x or equal.

L. PLUG LOAD CONTROL CONVENIENCE OUTLET: (20 amp/125v/3 wire)

01 Industrial, extra heavy-duty, permanently marked.

02 Tamper Resistant

a. Legrand TR5362CHx with one controlled face.

b. Legrand TR5362CDx with two controlled faces.

M. GFCI OUTLET: (20 amp/125v/3 wire) (Extra Heavy-Duty, Tamper-Resistant, LED

Indicators, Auto Self-Test).

01 Industrial, Extra Heavy-Duty, Tamper-Resistant: Hubbell GFSG5362X, Legrand 2097TR-X, Leviton G5362-0TX

02 GFI outlets in the kitchen, concessions stand, or similar spaces shall be Industrial, Extra Heavy-Duty, Tamper-Resistant, Weather Resistant: Hubbell GFSG5362X, P&S 2097TRWR-X or Leviton G5362-WTX.

03 GFI outlets at the exterior of the building or damp/wet locations shall be Industrial, Extra Heavy-Duty, Tamper-Resistant, Weather Resistant: Hubbell GFSG5362X, Legrand 2097TRWR-X, Leviton G5362-WTX.

04 Provide standard receptacle with remote dead front GFI device in lieu of a GFI receptacle as required complying with NEC requirements for readily accessible devices.

N. ISOLATED GROUND GFCI OUTLETS: (20 amp/125v/3 wire)

01 Industrial, Extra Heavy-Duty, Tamper-Resistant & Isolated Ground, Orange Color: Hubbell GFTWRST20IG , Legrand 2097IGTR-O, Leviton GFTR2-IGO

02 Provide standard isolated ground receptacle with remote dead front GFI device in lieu of an isolated ground, GFI receptacle as required to comply with NEC requirements for readily accessible devices.

O. PLUG LOAD CONTROL GFCI OUTLET: (20 amp/125v/3 wire)

01 Heavy-duty, permanently marked.

02 Tamper Resistant, Weather Resistant

a. Hubbell GFRTW20C2W, Leviton G5362-2T with two controlled faces.

P. BRANCH CIRCUIT REMOTE GFI PROTECTION DEVICES

01 DEAD FRONT GFI: (20 amp, 125v/3 wire), Legrand 2087, Hubbell GFBFHP20, Leviton GFRBFW (LED Indicators, Auto Self-Test) (Red if on generator)

a. Blank Face

b. ≥1 HP Switch Rated

c. Provide standard receptacle with remote dead front GFI device in lieu of a GFI receptacle as required to comply with NEC requirements for readily accessible devices.

02 HARD WIRED GFI MODULE (30 amp rated, 125v/3 wire, 240v/3 wire, 120/240v/4 wire, 250v/4 wire, or 208Y/120v/5 wire), Hubbell GFHW (LED Indicators, Auto Self-Test, Automatic Reset)

a. In-line wired at end device.

b. Class A GFCI.

c. Install in a readily accessible location to comply with NEC requirements.

Q. CONVENIENCE OUTLET WITH USB CHARGING PORTS: (20 amp/125v/3wire),

01 Combination Duplex Decora Receptacle and USB Charger

02 20A, 120V Duplex Receptacle, Tamper Resistant

03 One (1) type-A USB port, 1.5 Amp, 5 Volt DC

04 One (1) type-C USB port, 55 Watt, 20 Volt DC

05 Hubbell USB20ACPDx or equal.

R. SPECIAL DEVICES: Refer to Drawings; all devices shall be specification or industrial heavy-duty grade. Provide matching cord and cap.

S. PLATES:

01 Provide combination and/or gangable plates where adjacently located multi-outlet assemblies are indicated on drawings which shall include multi-switch installations.

02 Provide Type 302/304 smooth stainless steel plates with stainless steel mounting screws for typical devices.

a. Plates for surface mounted switch or outlet boxes shall be Sierra galvanized steel handy box plates (H series).

b. Provide powder coated steel faceplates with matching mounting screws where specific colors are indicated such as on stages or in black boxes.

03 Standard plate sizes only. Trademaster, Medium, or Jumbo plates are not acceptable.

T. WEATHERPROOF COVERS:

01 Electrical devices noted “WP” shall have weatherproof covers.

02 Devices 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. Hubbell MX Series, Legrand CA Series, or equal.

03 Devices subject to direct rainfall shall have a die-cast, aluminum, in-use cover rated for wet location with cord connected to device. Hubbell MX Series, Legrand WIUCAST1, or equal.

04 Convenience receptacles in interior spaces such as in a mechanical space or shop space not intended to serve specific equipment shall have aluminum self-closing covers that are rated for wet location with cover closed. Hubbell MX Series, Legrand CA Series, or equal.

05 Receptacles in interior spaces to be utilized for use with specific equipment such as in a kitchen or shop space shall have a die-cast, aluminum, in-use cover rated for wet location with cord connected to device. Hubbell MX Series or Legrand WIUCAST1, or equal.

U. INTERIOR FLOOR OUTLETS:

01 Single Service Locations:

a. For standard receptacles and outlets mounted in floors provide Wiremold 880 OMNI floor boxes.

b. For furniture feed floor outlets provide Wiremold EFBFF-OG floor boxes.

c. Provide cast iron, on-grade style for ground level floors, and fire rated steel type for above grade floors.

d. Provide cover with hinged access openings.

02 Multi Service Locations

a. Floor receptacles, data, A/V or telephone outlets served through U. L. fire rated floor structures shall use Hubbell SystemOne Recessed 8 Inch Poke-Thru assembly with cover.

b. Floor receptacles, data, A/V or telephone outlets at grade level shall be installed in Hubbell SystemOne CFB6G30RCR or CFB6G30CR 6-gang adjustable box with cover. Square or round to be selected by Architect.

c. Provide matching device plate for power receptacles and low voltage devices.

d. Provide blank inserts for unused spaces.

e. Provide dividers to maintain separation between different services.

03 Provide matching heavy duty hinged metal floor cover and ring to match floor material listed on Architectural Floor Finish Schedule. Color and cover shape shall be selected by Architect.

04 Equal by Hubbell, Legrand, or FSR shall be acceptable.

V. DIMMERS:

01 Provide single pole and 3-way operation as indicated.

02 Provide dimmer switch matching controlled fixture type, voltage, and 150% of load served.

03 Stand Alone, 0-10V Slide Dimmer: Legrand Radiant Series, Philips Sunrise Series, Leviton Renoir II Series or equal.

W. DOOR BUZZER:

01 120V AC, 70dB at 10ft, Edwards 340A Series Vibrating Buzzer.

02 120V AC, high voltage push button in stainless steel plate. Push button shall be suitable for the installed environment.

a. Edwards 852 or Dortronics WR5276-HD22xE8

b. Edwards 821 in 149 series push button plate.

03 120V AC, rotating beacon with amber polycarbonate dome. 40 watt, 265 lumen, 50LMP-40WH halogen lamp with 25,000 hour projected lamp life.

a. Edwards 52A-N5-40WH

X. PANIC ALARM STROBE:

01 Edwards 860 series xenon horn/strobe with red lens.

END OF SECTION 26 27 26

SECTION 26 28 00 - LOW-VOLTAGE CIRCUIT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

PART 2 - MATERIALS AND METHODS

2.1 FUSED AND SAFETY DISCONNECT SWITCHES

A. GENERAL: Provide a safety disconnect switch for each motor, motor starter, electric duct heater and other equipment required by the NEC. Provide fusible where shown. Switches shall be listed for use with 75° C wiring.

B. TYPE:

01 Heavy duty switch sized for load served; non-fusible where used purely as disconnect device.

02 Switches shall have minimum rating equal to upstream overcurrent protection amperage and voltage or as indicated on the drawings, whichever is greater.

03 Fused switches shall accommodate Class RK1 or RK5 fuses.

04 Combination starter disconnect switch shall be provided where shown on the drawings.

05 Disconnect switches for motors controlled by variable frequency drives shall have auxiliary “early break” contact to turn off VFD when motor is disconnected.

C. ENCLOSURE:

01 Provide NEMA 1 enclosure for switches inside, and NEMA 3R for switches outside unless otherwise noted to be NEMA 4X stainless steel on the Drawings or specifications.

02 Switches located in the kitchen area shall be NEMA 4X stainless steel.

03 Switches located within 50ft of a cooling tower shall be NEMA 4X stainless steel.

D. FUSES: Refer to section on fuses.

E. NAMEPLATE: Provide each device with an engraved nameplate showing load served, voltage, and circuit number.

F. MANUFACTURERS: GE Industrial (ABB), Siemens, Eaton, and Square D.

2.2 ENCLOSED CIRCUIT BREAKERS

A. TYPE: Single or multi-pole circuit breaker suitable for the short circuit requirements as listed on the Drawings.

B. ENCLOSURE:

01 Provide NEMA 1 enclosure for circuit breakers inside, and NEMA 3R for circuit breakers outside unless otherwise noted to be NEMA 4X stainless steel on the Drawings or specifications.

02 Circuit breaker enclosures located in the kitchen area shall be NEMA 4X stainless steel.

03 Circuit breaker enclosures located within 50ft of a cooling tower shall be NEMA 4X stainless steel.

C. NAMEPLATE: Provide each device with an engraved nameplate showing load served, voltage, and circuit number.

D. LARGE TRANSFORMERS: Provide adjustable type breakers for overcurrent protection of all low voltage transformers 112.5kVA and larger.

E. LARGE MOTORS AND EQUIPMENT: Circuit breakers serving 50 hp and larger motors or large equipment such as chillers shall be adjustable type coordinated with the starting requirements of the equipment.

F. COORDINATION STUDY: Provide an electrical coordination study to determine settings of adjustable circuit breakers to match equipment served. Include revised setting of adjustable circuit breakers during the warranty period required to eliminate nuisance tripping. Provide copy of the coordination study with closeout documents.

G. MANUFACTURERS: GE Industrial (ABB), Siemens, Eaton, and Square D.

2.3 FUSES

A. GENERAL: Provide fuses for all fused switches and noted on the Drawings and schedules.

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.

C. SPARES:

01 Reference 260010 Closeout Requirements.

D. MANUFACTURERS: Bussman, Littelfuse or approved equal

2.4 ELEVATOR DISCONNECTING MEANS

A. GENERAL: Provide a fused, lockable, shunt trip, disconnect switch or enclosed circuit breaker for each elevator required by the NEC. Disconnecting means shall be listed for use with 75° C wiring. All products shall be manufactured in the United States.

B. TYPE:

01 Heavy duty switch sized for load served

02 Switches shall have minimum rating equal to upstream overcurrent protection amperage and voltage or as indicated on the drawings, whichever is greater.

C. ENCLOSURE:

01 Provide NEMA 4 enclosure for switches inside elevator shafts unless otherwise

noted to be NEMA 4X stainless steel on the Drawings or specifications.

D. OPERATION:

01 Double-make, double break switch blade feature.

02 Control power transformer.

03 Shunt-trippable mechanism

a. Coil voltage rating 24, 48, 120, 240, 480 VAC and 24, 48 and 125 VDC

b. Minimum operating voltage 55% of nominal rating for AC coils

c. Rated for Class 1 ground fault interruption

d. 3 cycle maximum response time

E. LOCKABLE: The fused disconnect or circuit breaker serving an elevator shall be capable of being locked in the off position.

F. OVERCURRENT PROTECTION CHARACTERISTICS:

01 Elevator disconnecting means shall be selected to limit the available fault current to the equipment SCCR. Include the elevator disconnecting means and equipment in the electrical coordination model.

02 Fuses shall be current limiting class RK1 or equivalent.

03 Circuit breakers shall have current limiting characteristics equivalent to class RK1 fuses.

04 Fuses or circuit breakers shall be time delay to cover the full load up accelerating current as listed by the elevator manufacturer.

G. AUXILIARY CONTACTS:

01 The disconnecting means required by the NEC shall be provided with an auxiliary contact with wiring to the elevator controller per NEC (2020) 620.91.

02 Provide interface and relays for connecting to fire safety and fire alarm systems. Coordinate with other trades for quantity and voltages.

H. FUSES: Refer to section on fuses.

I. NAMEPLATE: Provide each device with an engraved nameplate showing load served, voltage, and circuit number.

J. MANUFACTURERS: Littelfuse LPS Series Shunt Trip Disconnect Switch or equal by GE Industrial (ABB), Square D, or Eaton.

END OF SECTION 26 28 00

SECTION 26 29 00 - LOW-VOLTAGE CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

PART 2 - MATERIALS AND METHODS

2.1 PHASE LOSS MONITOR

A. Motor starters not in motor control centers are provided under Division 23.

B. For each motor starter, provide and install a Time Mark Series 18 monitor. Wire into starter control circuit to de-energize motor on phase loss, phase reversal or low voltage. Unit automatically resets after fault conditions are corrected, after adjustable time delay. Do not provide for chiller, DX compressor motors, or motors controlled by a VFD. 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.

2.2 MANUAL MOTOR STARTER WITH THERMAL OVERLOAD AND PILOT LIGHT.

A. All switches shall have minimum rating of upstream overcurrent protection.

B. All switches shall have red pilot light integral to the switch cover.

C. All switches shall have an integral thermal overload unit to protect downstream devices. Coordinate thermal overload unit with device to be protected.

D. Where switches are used as disconnecting means the switch shall be lockable in accordance with NEC (2020) 110.25. Provide integral locking tabs on enclosure or lockable switch bracket mounted to the device plate. P&S 7801-P or equal.

E. Acceptable manufacturers: Square D FG Series or equal by GE Industrial (ABB), Siemens, or Eaton.

2.3 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. Contactors for lighting control shall be provided with a minimum of two (2)

spare poles for future use.

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 HOA switch to allow manual control of lights. Provide NEMA 3R enclosure for exterior locations or as indicated on the drawings.

01 Coordinate with BAS controls contractor to provide coil voltage matching BAS design for all circuits controlled by the BAS.

02 For all other circuits provide 120 volt coil. Provide controls transformer with input and output fusing if circuit controlled is not 120 volt.

D. LABELING: List circuits controlled inside enclosure. Provide contactor nameplate.

E. ACCEPTABLE MANUFACTURERS: GE Industrial (ABB), Eaton, Siemens and Square D.

2.4 TIME CLOCKS

A. GENERAL: Contacts shall have poles and rating consistent with the load being served but shall have a minimum of two circuits, 20 amps per circuit at 277 volts. The load may consist of all types of ballasts, resistance and motor loads. Provide NEMA 3R enclosure in wet and exterior locations.

01 Provide time clocks for the specified systems when not controlled by the BAS.

02 Multicircuit time clocks shall be capable of combined, independent, or pulse mode.

B. Astronomical Time Clock:

01 Two circuit, seven day operation with supercapacitor backup. Intermatic Model ET2825C

C. Water Heater & Circulation Pump Time Clock:

01 Electronic programmable timer with battery backup. Intermatic EH40 with 2T2926A enclosure.

END OF SECTION 26 29 00

SECTION 26 32 13 - PACKAGED GENERATOR ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 RELATED WORK

A. Division 14 - Elevators

B. Section 23 09 23 – Direct Digital Control System for HVAC

C. Section 23 09 93 – Sequence of Operations for HVAC Controls

D. Section 26 09 43 – Network Lighting Controls

E. Section 26 24 00 – Switchboards and Panelboards

F. Section 26 36 13 – Manual Transfer Switch

G. Section 26 36 23 – Automatic Transfer Switch

PART 2 - MATERIALS AND METHODS

2.1 STANDBY GENERATOR

A. GENERAL: The unit shall operate on natural gas and be constructed for outdoor installation. A generator monitor panel and transfer switch shall be located remotely in the facility.

B. ACCESSORIES:

01 Provide 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.

02 Provide remote annunciator.

03 Level 2 Weatherproof Sound Enclosure with internal silencer.

04 AC output line circuit breakers as indicated on the drawings. Generator breakers shall be electronic trip type.

05 Starter batteries.

06 Provide remote emergency stop per NEC requirements. Confirm location with Owner.

07 Generator Electrical Accessories:

a. Alternator Heater: Single point 300 watt, heater at 120V single phase.

b. Coolant Heater: 1500W at 208V or 120V single phase.

c. Battery Charger: 10 amp, 24 volt battery charger at 120V single phase.

d. Remote E-stop shutoff/disconnecting means per NEC requirements, confirm location with Owner.

1) Red mushroom type.

2) Flush or surface mounted as directed by the Owner.

e. Internal Work Light(s) in Generator Housing: 20A at 120V single phase.

f. Internal Convenience Outlets: Quantity two (2) 20A, GFCI receptacles with WP cover. Receptacles may be on a single circuit.

1) Convenience outlets may be combined with the internal work light on a single circuit.

08 Voltage sensing dry contact to verify AC power generation.

09 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. Service gas pressure will be 5 psi.

11 Cables between unit, batteries, charger, controller, remote annunciator and transfer switch.

C. FACTORY TESTING: After installation provide complete startup and checkout of generator and transfer switch. Provide 8 hour load test and run-in with full load following startup. Test results to be provided as part of close out documents.

D. FINAL SYSTEM APPROVAL: The final approval test of the generator system shall consist of opening the building main circuit breaker to simulate a system power failure. Generator shall start and automatically transfer power to the emergency electrical panels. 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. Generator shall wait the prescribed time then shut off. Test shall be performed by the factory authorized representative and witnessed by SEG and school personnel.

E. SUBMITTAL DRAWINGS:

01 Provide engineered drawings showing equipment dimensions and connections.

02 Provide installation and wiring drawings for the standby generator and transfer switch system.

03 Include equipment description noting capacity and accessories, and a service/operation manual.

04 Provide maximum fault current available that the generator can deliver.

05 COORDINATION: Generator breaker selection(s) shall be made as a result of the electrical system coordination study generated by the Division 26 contractor. Refer to specification section 262400 for coordination study requirements.

06 All information shall be in pdf format.

07 Reference 260000 General Electrical Requirements for additional information.

F. TRAINING:

01 Reference 260010 Closeout Requirements.

G. WARRANTY:

01 Reference 260010 Closeout Requirements.

H. SERVICE CONTRACT:

01 Reference 260010 Closeout Requirements.

I. CLOSEOUT DOCUMENTS:

01 Reference 260010 Closeout Requirements.

J. ACCEPTABLE MANUFACTURERS: Caterpillar, Kohler and Onan/Cummins.

END OF SECTION 26 32 13

SECTION 26 36 13 - MANUAL TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 26 32 13 – Packaged Generator Assemblies

C. Section 26 36 23 – Automatic Transfer Switches

PART 2 - MATERIALS AND METHODS

2.1 MANUAL TRANSFER SWITCH

A. GENERAL: Provide transfer switch matched to mobile generator output circuit indicated on the drawings. Switch shall have three poles with neutral bar installed in wall mounted cabinet. Cabinet shall be NEMA 1 where located indoors and NEMA 3R when located outdoors except where noted as 4XSS on the drawings. Where located in the kitchen areas or within 50ft of cooling towers the enclosure shall be NEMA 4X stainless steel. Provide switching sequence compatible with the electrical utility requirements.

01 The transfer switch unit shall be manually operated and mechanically held. The switch shall be mechanically interlocked to ensure only one of three possible positions, Source 1, Source 2, or Center Off. Fused disconnect type switches shall not be acceptable.

02 The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

03 All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.

04 Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

05 Designs utilizing components of molded-case circuit breakers, contactors, or

parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

06 The MTS shall be tested in accordance with UL 1008 for transfer switches. Switch ratings of 260 amperes and less shall have endurance rating of 6000 cycles, 400 ampere shall have endurance rating of 4000 cycles, and 600 – 1200 ampere shall have endurance rating of 3000 cycles.

B. Enclosure

01 NEMA 3R Rain-Tight Aluminum Enclosure

a. Pad-lockable front door shall include a hinged access plate at the bottom for entry of temporary cabling an NEC 702.12C compliant door interlock that prevents unauthorized tampering while in use

b. NEMA 3R Integrity shall be maintained while temporary cabling is connected during use

c. Front and Side shall be accessible for maintenance

d. Top, Side, and Bottom shall be accessible for permanent cabling

e. Extra depth for bottom conduit access.

02 Powder coat

a. Paint after fabrication shall be Hammer tone Gray

C. Phase, Neutral, and Ground Busbar

01 Material: Silver-plated Copper

02 Equipment Ground Bus: Bonded to box.

03 Isolated Ground Bus: Insulated from box.

04 Ground Bus: 50% of phase size.

05 Neutral Bus: Neutral bus rated 100% of phase bus.

D. Temporary generator and Load Bank connectors shall be Camlok style mounted on gland plate.

01 Camlok shall be 16 Series model and color coded according to system voltage requirements.

02 Camlok connections shall be Bus Bar Style; Cabling or Double Set Screw type are not acceptable

03 Camlok connection shall be protected against accidental contact while not in use

E. Permanent Connection shall be factory installed broad range set-screw mechanical type, located behind a physical barrier

F. Transfer Switch Configuration

01 Docking Station shall have integrated Rotary Transfer Switch (MTS).

a. MTS shall have three positions – Utility/Permanent Line – OFF – Temporary Line

b. MTS shall be located behind pad lockable door to prevent any tampering by unauthorized personnel.

G. Short Circuit & Withstand Rating

01 Shall have minimum kAIC ratings as indicated below unless otherwise indicated on the drawings:

a. 100-200A MTS 14KaIC

b. 400A MTS 25KaIC

H. Voltage & Amperage

01 Voltage System and Ampacity as indicated on the drawings.

I. Factory Installed Phase Rotation Monitor Device:

01 Phase monitoring relay to be Siemens 3U4512-1AR20 or equal and factory installed

J. ACCESSORIES:

01 Two Wire Auto Start

02 Battery Charger Receptacle 20A, GFCI, 125V

03 Block Heater Receptacle 30A, L5-30, 125V

04 375W Strip Heater & Thermostat

05 NEC 702.12C compliant door interlock

06 Additional accessories shall be included in submittal drawings.

K. OPERATION:

01 The manual transfer switch shall be arranged for manually actuated operation.

02 The manual transfer shall be actuated via a mechanical operating mechanism.

03 The manual operating handle shall be capable of external operation without opening the enclosure door.

04 The manual transfer switch shall have the same contact to contact speed as automatic operation.

05 There shall be three positions for manual operation:

a. Connected to Source 1 (permanent generator or utility power)

b. Connected to Source 2 (mobile generator)

c. Connected to center off (disconnected position)

06 Switch position when connected to Source 1 or Source 2 shall have locking provisions.

L. SUBMITTAL DRAWINGS: Provide installation drawing for the manual transfer switch. Include equipment description noting capacity and accessories, and a service/operation manual. All information shall be in pdf format.

M. TRAINING:

01 Reference 260010 Closeout Requirements.

N. WARRANTY:

01 Reference 260010 Closeout Requirements.

O. CLOSEOUT DOCUMENTS:

01 Reference 260010 Closeout Requirements.

P. ACCEPTABLE MANUFACTURERS:

01 Basis of Design: Trystar, model as indicated on the drawings.

02 Other equivalent models by Eaton, Power Temp Systems, and Salient Industries.

END OF SECTION 26 36 13

SECTION 26 36 23 - AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 RELATED WORK

A. Division 14 - Elevators

B. Section 25 50 00 – Direct Digital Control System for HVAC

C. Section 25 95 10 – Sequence of Operations for HVAC Controls

D. Section 26 09 43 – Network Lighting Controls

E. Section 26 32 13 – Packaged Generator Assemblies

F. Section 28 13 00 – Security and Access Control Systems

PART 2 - MATERIALS AND METHODS

2.1 AUTOMATIC TRANSFER SWITCH

A. GENERAL: Provide transfer switch matched to generator output capacity. Switch shall have three poles with neutral bar.

01 Provide NEMA 1 enclosure where mounted inside unless noted otherwise in the drawings or these specifications.

02 Provide NEMA 3R enclosure where mounted outside unless noted to be NEMA 4X stainless steel on the Drawings.

03 Provide integral strip heater and thermostat where mounted outside. Strip heater and thermostat to be wired/powered from the load terminals.

04 Provide switching sequence compatible with the electrical utility requirements.

B. RATINGS: 480 volts, 3 phase with minimum current rating as indicated on the drawings. Unit shall have a minimum long-time/closing rating of 14,000 AIC independent of the system circuit breaker and fully rated AIC as part of a listed, series combination with the specific circuit breakers installed upstream of the switch.

C. ACCESSORIES:

01 Basic indicator panel

a. Source available/connected LED indicators

b. Test/exercise/override buttons

02 Analog LED bar graph display capable of displaying 3-phase voltage, current, frequency, power factor and kilowatts with LED status indicators.

03 Programmable exerciser with weekly and monthly scheduling.

04 Extended start time delay (0 to 90 seconds).

05 Programmed transition (0 to 60 seconds).

06 Over/undervoltage sensing.

07 Over/under frequency sensing.

08 24 volt coil auxiliary relay with 2-NO and 2-NC dry contacts.

09 Additional auxiliary contacts indicating source connection, source availability, equipment settings and alarms to be monitored external systems.

10 Loss of single phase detection.

D. EXERCISER SETTINGS: Exerciser schedule day and time to be coordinated with the Owner.

E. SUBMITTAL DRAWINGS:

01 Provide engineered drawings showing equipment dimensions and connections.

02 Provide installation and wiring drawings for the standby generator and transfer switch system.

03 Include equipment description noting capacity and accessories, and a service/operation manual.

04 Provide AIC series rating tables for selected ATS.

a. Highlight series rating of ATS with upstream generator and upstream normal power circuit breakers.

b. Coordinate upstream breakers with selected ATS to ensure sufficient AIC of the system for all available fault currents.

05 COORDINATION: Generator and normal power breaker selection(s) shall be made as a result of the electrical system coordination study generated by the Division 26 contractor. Refer to 262400 for coordination study requirements.

06 All information shall be in pdf format.

07 Reference 260000 General Electrical Requirements for additional information.

F. TRAINING:

01 Reference 260010 Closeout Requirements.

G. WARRANTY:

01 Reference 260010 Closeout Requirements.

H. CLOSEOUT DOCUMENTS:

01 Reference 260010 Closeout Requirements.

I. EXERCISER SCHEDULE:

01 Initial setting shall be Sundays at 10:00am. Adjust settings as directed by the

Owner.

J. ACCEPTABLE MANUFACTURERS: ASCO, Caterpillar, Eaton, Kohler and Onan/Cummins Power Generation.

2.2 CONNECTIONS TO OTHER SYSTEMS

A. ELEVATOR CONNECTIONS

01 Automatic transfer switches shall be provided with three sets of normally closed dry contacts.

a. One to open when the switch is in the Emergency (Standby) Power position.

b. The second to open upon initiation of power transfer and to close when transfer is complete.

c. For connection to the elevator shunt trip device.

B. BAS CONNECTIONS

01 BAS to monitor status of generator/ATS system including Generator Run Status, ATS Source Power, ATS Source Availability, ATS Load Position.

C. SECURITY SYSTEM CONNECTIONS

01 Security System to monitor status of generator/ATS system including Generator Run Status, ATS Source Power, ATS Source Availability, ATS Load Position.

D. Coordinate with other trades for control wiring connections from ATS contacts to elevator, security, BAS equipment and related electrical equipment.

END OF SECTION 26 36 23

SECTION 26 43 00 - SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 ABBREVIATIONS

A. TVSS Transient Voltage and Surge Suppressor

B. SPD Surge Protection Devices

C. The terms TVSS and SPD shall be used interchangeably where they appear in these documents.

PART 2 - MATERIALS AND METHODS

2.1 EXTERNAL TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS/SPD)

A. GENERAL: Provide external SPD equipment for electrical panels and equipment as noted on the Drawings. Some equipment may be noted to have SPD integral to panel or switchboard.

B. INSTALLATION: External SPD shall be installed in NEMA 1 housing and mounted adjacent to the equipment to be protected. Provide NEMA 4X housing in the central plant, boiler rooms and exterior locations. Provide a three pole circuit breaker in the panel or direct bus connection with integral OCPD and disconnect within SPD cabinet. Connect SPD with wiring as short and straight as possible.

C. DISPLAY: Provide LED status indicators and digital transient counter with battery backup.

D. ALARM: Provide audible alarm with silence and test function.

E. SUPPRESSION MODES: System shall provide suppression of L-L, L-N, L-G, and N-G transients.

F. RESPONSE TIME: 1 nanosecond or less.

G. EMI/RFI ATTENUATION: 38 dB or better.

H. MONITORING: Provide remote monitoring contacts, dry, 1 form C type, rated for 120V, 1A (30A VDC, 2A).

I. WARRANTY: 10 year, non-prorated replacement.

J. MINIMUM SPD RATING:

01	Panels smaller than 400 amps:	100 kAmps per phase
02	Panels 400 amps up to 800 amps:	150 kAmps per phase
03	Panels 801 amps up to 2000 amps:	240 kAmps per phase
04	Panels greater than 2000 amps:	400 kAmps per phase

05 Reference drawings for scheduled SPD ratings which may exceed the minimum values indicated here.

K. ACCEPTABLE MANUFACTURERS: GE Industrial (ABB), Siemens, Square D, Current Technology, Liebert, and MTE.

2.2 SPECIAL EQUIPMENT TRANSIENT VOLTAGE SURGE SUPPRESSOR (SPD)

A. EQUIPMENT PROTECTED: Install for fire alarm panel, security panel, access control panel and CCTV panel branch circuits, including all sub panels and power supplies.

B. INSTALLATION: Install device in junction box surface mounted in mechanical/electrical rooms or above accessible ceiling if equipment is not in mechanical/electrical room. The branch circuit shall terminate on the SPD and then subfeed the equipment. The wire between the device and the equipment shall be approximately three to five feet long.

C. SPD MODEL:

01 Ditek Model DTK-120SRD surge suppressor with dry contacts

a. Provide for fire alarm systems. Fire alarm system to monitor contacts.

02 Space Age Electronics E120V-GT Hybrid Surge Protector

2.3 TELEPHONE LINE TRANSIENT VOLTAGE SURGE SUPPRESSOR (SPD)

A. GENERAL: Install for telephone connections to fire alarm and security alarm dialers.

B. SPD MODEL: Ditek Model DTK-MRJ31XSCP-WP

2.4 LOW VOLTAGE CABLING TRANSIENT VOLTAGE SURGE SUPPRESSOR (SPD)

A. GENERAL: Provide surge protectors to protect low voltage cabling at all locations where it enters and exits a building.

B. SPD MODEL: Ditek 2MHLP Series, Ditek MRJ Series, or equivalent. Provide model matching voltage, wattage, data rate and type of cabling to be protected.

END OF SECTION 26 43 00

SECTION 26 50 00 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

PART 2 - MATERIALS AND METHODS

2.1 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 HID 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 lens doors shall securely attach to the housing with spring operated latches to prevent release due to vibration or gravity.

B. PAINT: All fixture housings shall have a complete coverage of white enamel or baked polyester powder finish with 85% minimum reflectivity.

C. PLASTIC REFRACTORS/DIFFUSERS: Material shall be light-stable 100% virgin acrylic with a nominal thickness of .125".

01 Provide non-conductive "dead front" lens/reflector for shower fixtures.

A. LED FIXTURES: LED lamps shall be 4000K color temperature with a minimum CRI of 80 or as noted on the drawings/schedules and shall come standard with 0-10V dimming and a minimum five (5) year warranty on LED boards, drivers, and components. All LED fixtures shall be DesignLights Consortium (DLC) or EnergyStar certified. Models shall have a minimum projected life of 50,000 hours at 90% lumen output using IESNA LM-79, LM-80 and TM-21 standards. Submittal information must contain projected L90 lifetimes using TM-21 data at minimum 25°C (77°F) for all interior fixtures.

D. LED DRIVERS: LED drivers shall be electronic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 "Electronic Drivers for LED Devices, Arrays, or Systems". LED drivers shall have a sound rating of "A", have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.

01 Dimmable LED fixtures shall have a 0-10 volt, 3-wire, phase, or a two-step (50%-100%) line voltage, two switch controlled dimming driver, as shown on the

drawings. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across their full dimming range.

02 Drivers shall be rated for the ambient temperatures and conditions in which they are located.

a. Fixtures in wet locations shall be equipped with wet rated drivers.

b. Fixture in cold locations shall be equipped with drivers designed for reliable starting to -20° F.

c. Fixtures located in areas with above normal ambient temperatures shall have high ambient drivers rated at 55° C minimum.

d. Reference drawings for additional requirements.

03 Drivers shall be warranted for minimum five (5) years from date of substantial completion of the project.

E. 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.

F. SUPPORT: Securely support fixtures to prevent the fixture from falling. Lay-in fixtures shall be supported per the ceiling fire rating as specified by the Architect. Surface and pendant fluorescent fixtures shall be supported with two supports per four foot section. 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 shall have manufacturer supplied quick disconnect mounting hardware and safety cable.

G. CONSTRUCTION: Provide stainless steel hardware and integral 10kV surge protection for exterior fixtures and fixtures in wet locations.

H. SEALING: All conduits, junction boxes 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. Provide caulking or gasketed seals around fixtures to prevent water ingress.

I. LIGHT POLES: All poles shall be selected to support the scheduled fixtures and equipment per ASCE/SEI 7 minimum design loads or 120 MPH wind loading plus 1.3 gust factor, whichever is greater. Provide a reinforced concrete support base per the Drawing Details. Provide pole base cover to conceal lighting standard anchor bolts. Provide additional grouting as required/directed by the Owner/Engineer.

J.

2.2 EMERGENCY BACKUP:

A. EMERGENCY POWER PACKS: Emergency battery packs/drivers shall be high output, self-contained, and mounted internal to fixture. Units shall be long life nickel cadmium sized for 90 minute operation with a 120/277 volt solid state charger and automatic transfer switch.

01 Unit shall provide a minimum nominal 1400 lumen output from the specified LED or fluorescent lamps. Where 1400 lumens exceeds the standard capacity for the scheduled fixture, the emergency battery pack/driver with the maximum capacity shall be provided.

02 Units shall be rated for the ambient temperatures and conditions in which they are located.

a. Fixtures in wet locations shall be equipped with wet rated units.

b. Fixture in cold locations shall be equipped with units designed for reliable operation to -20° F.

c. Fixture located in areas with above normal ambient temperatures shall have high ambient units rated at 55° C minimum.

d. Reference drawings for additional requirements.

03 Emergi-lite, Iota, Bodine or approved equal.

B. EMERGENCY TRANSFER RELAYS: Provided under 26 09 43 Network Lighting Controls

2.3 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices:

01 Reference 260010 Closeout Requirements.

B. Electrical contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion.

2.4 WARRANTY:

A. Reference 260010 Closeout Requirements.

END OF SECTION 26 50 00

SECTION 26 55 61 - THEATRICAL LIGHTING AND CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 26 00 00.

1.2 INTENT

A. The intent of this specification is to define parameters for furnishing and installing a complete and working new dimming and control system. Performance deviations will not be accepted. One company shall be responsible for installing or coordinating the install of all aspects of the stage equipment. Work under this section shall include the furnishing of all labor, materials, tools, transportation services, supervision, etc., necessary to complete installation of new stage equipment

B. All work must be done in compliance with the National Electric Code and applicable local codes.

C. Contractor is responsible for providing a complete and working system. All items needed for a complete and working system meeting the design intent of the plans and specifications are to be included, even if not specifically listed.

1.3 APPROVED EQUIPMENT

A. Dimming, Controls, Fixtures, and Motorized Hoist equipment: Approved manufacturer: Electronic Theatre Controls: 800-688-4116

B. Refer to 26 00 00 and substitutions paragraph below for prior approval submittal requirements.

1.4 SUBSTITUTIONS

A. Specific items of equipment are listed by trade names. The Owner has determined that these are the particular items desired by the Owner for quality and to ensure compatibility across the school district. It is neither the purpose nor intent of these documents to eliminate competitive bids. In order to allow proper and fair comparison of pricing, each contractor is required to submit his base bid price on the specified equipment.

B. A contractor may submit an alternate bid based on equipment different from that specified only if that Contractor has received prior approval in writing from the Owner at least 10 days prior to bid. Accompanying each request shall be a letter specifically detailing each substitution including catalog data, specifications, operative samples,

technical information, drawings, performance and test data, and complete descriptive and functional information to assist in a fair evaluation. Substitution requests shall be submitted for each component of the lighting and rigging system and shall be evaluated separately. Requests shall also include a detailed line by line specification compliance letter. Any deviations from the specifications or drawings shall be listed and explained. Failure to submit any substitution for prior approval or not providing sufficient data for evaluation shall require the exact item specified to be furnished. Approval will be granted by Addenda Only.

C. Owner's approval of a substitution for bid purposes will not relieve the contractor from the responsibility of meeting all specification criteria. If an approval of a substitution is granted, the Contractor shall be fully responsible for any and all changes such substitution shall require.

1.5 QUALITY ASSURANCE

A. To ensure a complete uniform installation and single point of responsibility for system design and warranty, one manufacturer shall provide all dimming, rigging, control system and fixture components. Mixing of equipment brands will not be accepted.

B. Manufacturer shall provide local on-site service for the system for a period of two years from date of acceptance by the Owner. This person or firm must be regularly engaged in the service of dimmers. A salesperson or sales agent without dedicated service personnel does not meet this requirement.

C. This specification details specific operational and functional needs of the owner. Deviations from the performance requirements will not be accepted from any supplier. Contractor assumes the responsibility of removing any non-complying material discovered during the warranty period and replacing it with specification compliant equipment.

D. Due to the specialty nature of theatrical lighting equipment, a Theatrical Systems Contractor shall provide the theatrical dimming, rigging, and control equipment to the Project Electrical Contractor, as well as providing support and coordination services to ensure a complete working system.

E. The Theatrical Systems Contractor shall be an authorized dealer of the specified manufacturers and have been actively engaged in the sales, installation, repair and maintenance of theatrical lighting equipment for no less than ten full (10) years. Evidence of experience for projects of similar size and scope shall be submitted if requested. This evidence shall include a reference list for a minimum of five projects including: job name, contact name and phone number, scope and contract value.

F. The Theatrical Systems Contractor shall be an authorized service center for repair and support of the specified dimming products with a dedicated ETC Certified service technician available for local support.

G. The Theatrical Systems Contractor shall provide personnel with ETCP Rigging Certification for the installation of all overhead rigging components.

1.6 SERVICES

A. Services of qualified project manager, representing the manufacturer, and employed full time in the sales and service of control systems, shall be provided during the installation period to answer questions and review the installation.

B. Services of a qualified technician, representing the manufacturer, and employed full time in the service of control systems, shall be provided for one visit upon 21 days notice. This

technician shall terminate all low voltage control wiring, inspect the installation, energize the system, and program the architectural control system. He shall also instruct the owner in proper operation and maintenance of the system.

C. During the warranty period, the manufacturer shall provide a toll-free 24-hour-per-day number for telephone technical support and service request.

1.7 ARCHITECTURAL CONTROLS

A. Architectural control system shall include a high-resolution color touchscreen to provide the owner a contextual visual basis for lighting control without requiring specialized training or orientation for operators.

B. Preprogram Touchscreen LCD Station with (8) preset recalls that provide general stage control suitable for a variety of school events. Coordinate needed scenarios with school principal. Include as a minimum: Worklights, Rehearsal, Speaking Event, and Performance Event. Touchscreen shall include a color picker, a visual color wheel, for selecting colors on the LED fixtures. Touchscreen station shall include pages for adjusting individual lighting zones and recording into user-defined presets. Recording ability shall be password protected. Touchscreen controls without a color picker that has hue/saturation inputs for selecting LED fixture colors shall not be acceptable.

C. Within 6 months, if requested by owner, contractor shall schedule a return visit to make adjustments to the programming of the LCD Touchscreen Station and give follow-up training of equipment, if needed. Contractor shall not be responsible for regular maintenance such as lamp burnout and fixture refocus, but shall list any deficiencies found and provide a written report of any maintenance needed or deficiencies found

1.8 DRAWINGS

A. Dimming System Manufacturer shall provide .pdf electronic files for submittals, including system risers, rack schedules, and manufacturer cut sheets for all equipment.

B. Dimming System Manufacturer shall provide .pdf electronic files for Operation & Maintenance Manuals, to include Operation Manuals for all supplied equipment.

1.9 WARRANTY

A. The dimming manufacturer shall provide a two (2) year warranty on the entire lighting system from date of acceptance.

B. LED fixture manufacturer shall provide a five (5) year complete warranty, and a ten (10) year warranty on the light array.

1.10 SCOPE OF WORK

A. This section includes the following lighting control system equipment

01 Dimmers

02 Controls

03 Distribution

04 Motorized Hoist

05 Lighting instruments, lamps, and associated portable equipment

B. Work under this section shall include the furnishing of all labor, materials, tools,

transportation services, supervision, etc., necessary to complete the installation of new stage equipment as detailed in these specifications and accompanying documents.

C. The Theatrical Systems Contractor shall be responsible for the following:

01 Provide all dimming, control, distribution, fixtures, and hoist equipment as detailed and required in these specifications and associated drawings

02 Provide shop drawings indicating system layout, control wiring, physical mounting locations, and mounting techniques of all equipment

03 Furnish and install fixed hanging positions over stage, and motorized hoist front of house upon structure provided by the general contractor or structural contractor.

04 Install pipe mounted circuit boxes and raceways as required

05 Provide Factory Authorized Service Technician to perform system commissioning, low voltage terminations, installation of control plates, system programming, and minimum 2 hours training to on-site staff and 2 hours training to Owner's maintenance representatives.

06 Provide emergency bypass equipment as detailed. Coordinate with EC for emergency wiring needs, and fully test all emergency operation scenarios. Report any emergency operation deficiencies to the electrical contractor and the general contractor.

07 The System Contractor shall employ only fully trained stage riggers and mechanics, for the erection of the stage equipment. The stage riggers shall be completely familiar with the type of equipment to be installed. A competent job superintendent shall be on the job at all times when work is in progress. The job superintendent must be ETCP certified in theatre rigging. A copy of the certification must be furnished to the General Contractor prior to the start of the installation.

D. The Project Electrical Contractor shall be responsible for the following, with performance requirements as specified in other Division 26 specifications:

01 Installation of all dimming and control racks and equipment, including mounting of racks on walls, power feeds as required, and installation of custom back boxes.

02 Provision and installation of all standard back boxes

03 Provision and installation of all 120v distribution circuits, and all 120/208v feeder circuits for the theatrical lighting system

04 Terminating of all 120v and 120/208v power and distribution circuits, both in the dimmer cabinet, and at the circuit distribution.

05 Provision and installation of all conduit, junction boxes, electrical wire ways, and cable trays as required for the lighting systems, including low voltage control systems.

06 Pulling all high and low voltage cable into conduit

07 Clean all racks, panels, and boxes of dirt, dust, and debris, re-assemble all equipment, and replace all panels, covers, and screws prior to time of system factory energization and training

08 Coordination with the Theatrical Contractor on all aspects of the rigging and electrical installation and low voltage cable runs. Follow all manufacturer submittal plans and installation recommendations. Actively facilitate coordination with the General Contractor and Structural Engineer for all structural attachment

needs. Schedule adequate time at the end of the job for Theatrical Systems Contractor to commission the system before turnover to the owner.

09 At time of System Commissioning, Project Electrical Contractor is responsible for providing access to all low voltage termination points for termination and testing to the Service Technician. This includes lifts, ladders and personnel required to reach any position the Service Technician needs access to. Electrical Contractor shall also provide personnel as needed to the Service Technician for troubleshooting and any needed wiring changes, terminations, or testing. This person shall be made available whenever the service technician is on the job site.

10 Electrical Contractor is responsible for advance scheduling with the Theatrical Systems Contractor. Theatrical Systems Contractor shall be given at least 21 days notice of request for system startup. Electrical Contractor is responsible for having all equipment installed and wiring pulled & terminated prior to the arrival of the Theatrical Systems Contractor Service Technician for commissioning. If the jobsite is not ready when the Theatrical Systems Contractor has been scheduled to arrive, and additional trip(s) are necessary, the Electrical Contractor shall pay necessary additional trip charges .

E. All components necessary to make the system a complete and working lighting system shall be provided.

F. Verify site conditions and system layout during the project approval process, coordinating with other trades as required.

PART 2 - PRODUCTS

2.1 MATERIALS LIST:

A. 1 ETC UFMP8 8-Relay Foundry Mini Panel

B. 1 ETC Unison ERn2-W-120 Wall Mount Control Enclosure, with ERnNET Switch

C. 1 ETC Unison P-ACP-E Mk2: Paradigm Architectural Control Processor Mk2, enclosure mounted.

D. 1 ETC Unison P-SPM-E Mk2: Paradigm Station Power Module, enclosure mounted.

E. 1 ETC Unison URTO RideThru Option Kit, enclosure mounted. Provides at least 12 seconds of power backup to the control processor for brief power outages or dropouts.

F. 1 ETC Unison P-TS7-E-4 Paradigm Flush Mounted Color Touchscreen LCD Station with P-LCD-LC-4 locking cover, black

G. 1 ETC CS20 ColorSource 20 Control Console

H. 1 ETC CS20DC Dust Cover for the CS20 ColorSource 20 console.

I. 1 ETC I1866 Pelican Case with foam for the CS20 ColorSource 20 console.

J. 1 ETC Response OPTO-BOX DMX Repeater.

K. 2 Data Control Station: DMX Input, flush mounted

L. 4 Data Control Station: DMX Output, pipe mounted with backbox and ubolt kit

M. 1 50’ DMX Control Cable

N. 6 ETC 1 circuit outlet box with 20A, 120V Edison connector and ubolt hardware.

O. 8 ETC Colorsource Spot V Ellipsoidals 26 degree EDLT w/ Pipe clamp, trueone Edison connector or trueone jumper, DMX Cable, safety cable, and 5 color integrated LED light engine.

P. 14 ETC Colorsource PAR V Zoom Fixtures, complete with yoke, c-clamp, safety cable, power lead with standard Edison connector or trueone jumper, DMX cable, and 5 color integrated LED light engine

Q. Lot DMX Cables

R. Lot TrueOne Jumpers

S. Any other equipment or incidental items, even if not specifically mentioned, if necessary for a complete and working system shall be included by the contractor at no extra charge.

2.2 DIGITAL MINI PANELS

A. Mini Panels

01 Digital Panels for lighting and pluggable loads shall be the Foundry Mini Panel by ETC, Inc

02 Mechanical

a. Mini Panels shall be constructed of 16AWG steel and finished in a black fine-texture powder paint.

b. The Mini Panel shall be no larger than 9” x 12” x 3.5” for 4 output models or 14” x 12” x 3.5” for 8 output models

c. Mini Panels shall support wall and ceiling mounting, including installation in Plenum air return spaces.

d. A removable dead front cover shall be mechanically fastened using four screws.

e. An internal safety cover made of 16AWG steel shall prevent access to all line voltage (class1) wiring and components without limiting access to low voltage terminations, changing settings during commissioning, or manual control of relays.

f. Mini Panels shall support onboard configuration without the use of software using a simple two-button interface to set start address

g. The Mini Panel shall support an input for use in UL 924 Emergency Systems

h. A dry contact input shall provide triggering of an emergency condition

i. A three position switch shall set the input as Normally Open (NO) Normally Closed (NC), or Off

j. Load shedding shall be supported via a two position switch per zone, that includes or excludes each zone from the UL924 input

k. The Mini Panel shall support a Demand Response input to automatically reduce overall power consumption.

l. A dry contact input shall be supported to trigger the demand response condition

m. A single rotary dial shall be available for each to set the maximum trim level when the input is active

n. All configuration buttons shall be fully accessible when the Panel is

mounted and the front panel is removed.

o. Mini Panels shall provide the following LED indicators:

p. UL924 Active (red)

q. Demand Response Active (green)

r. Power OK (blue)

s. DMX Signal/Error (green)

03 Electrical

a. Power Input shall support 120-277 Volts AC 47-63Hz for control electronics and for each independent zone. Daisy Chain of an input to multiple control zones shall be supported

b. Mini Panels shall provide an optional 20A single-phase normal sense feed input for UL 924 Emergency Lighting Control Bypass

c. A voltage barrier shall be available to separate normal and emergency circuits or lighting and plug loads when combined in a single Panel. The barrier shall be constructed of UL94-V-0 plastic

d. All Mini Panels shall provide a 20 Ampere, fully rated, normally open relay for each output rated for lighting and plug load use

e. A 0-10V dimming output per zone shall support 0-10V sink control rated for 100mA per output

f. Mini Panels shall support Class 2, ANSI E1.11-2008, USITT DMX512A control communications

g. Mini Panels shall provide a DMX512A wiring connection using terminal blocks for #24 AWG wire

h. Terminal blocks for Cat5e or better wire shall also be available

i. The control network shall utilize unshielded twisted pair, Belden 9729 or equivalent wire, plus one #14 ESD drain wire (when not installed in grounded metal conduit). Use of Category 5e, or better, control network wiring shall also be supported when utilizing appropriate termination kits available from the manufacturer

j. Mini Panels shall be designed and tested to withstand discharges up to 15,000 volts (IEC 801-2) without impairment of performance.

k. Mini Panels shall provide a three position terminal for power input to the control electronics. The control power input shall accept 6-14AWG wire and be clearly marked Line, Neutral and Earth Ground

l. Each relay shall provide three screw terminals for line voltage power connection. Each terminal shall accept 6-14awg wire and be clearly labeled Input, Output and Thru. Panels that do not support a single power input to multiple discrete relays, in any combination, shall not be accepted.

m. Mini Panels shall support 0-10V dimming control via two 16-26AWG terminals for 0-10V+ and 0-10V common wiring connections

n. Mini Panels shall be UL and cUL LISTED and conform to UL 508 and UL 2043 (Plenum rated) standards

04 Functional

a. Mini Panels shall be available in 4 or 8 zone configurations with a 20 Ampere, fully–rated, relay output and 0-10V dimming per zone

b. Mini Panels shall be UL924 approved for emergency lighting circuits and shall activate only the selected outputs. Excluded loads shall be shed and not output during emergency conditions

c. Mini Panels shall support Demand Response input via contact closure. Upon input the Panel shall reduce maximum output to 70% of peak usage. 0-10V outputs shall support Demand response maximum level threshold adjustment using a rotary fader, and shall be assignable per circuit while measuring usage.

d. Upon loss of power, Mini Panels shall return to their last state when power returns

e. Mini Panels shall support commissioning without the use of software or specialty configuration tools. Panels that require software for configuration shall not be acceptable

f. All Mini Panels shall be configurable via ANSI E1.20 Remote Device Management (RDM). RDM parameters shall include:

g. Device Label – configure a name for the device

h. DMX Start Address –set the starting DMX address of the Zone Controller to a value from 1-512

i. DMX Fail Mode (Data Loss) – configure the Zone Controller behavior when DMX is lost: Hold last look, Wait and fade, Go to full (default)

j. Packet Delay – configure the number of packets required before the zone controller activates a change of level (relay on/off or 0-10V output)

05 Mini Panels that are not configurable over RDM shall not be acceptable

2.3 ARCHITECTURAL CONTROL PROCESSOR

A. The Architectural Control Processor shall be the Unison Paradigm P-ACP Series Control Processor as manufactured by Electronic Theatre Controls, Inc.

B. The Architectural Control Processor (ACP) assembly shall be designed for use in DRd Series Dimming Enclosures and ERn Series Control Enclosures.

C. The processor shall utilize microprocessor based, solid state technology to provide multi-scene lighting and building control.

01 ACP shall support functions such as station programming, macro sequencing, electronic lockout, room combine and astronomical time clock events. ACP station processor shall allow configuration of the control system via the menus. See software section for additional system details.

02 When used in a dimming enclosure, the ACP shall allow access to dimming control menus including the status screen, dimming configuration screen, backup menu, test menu and configuration menu.

D. One ACP shall be rated to drive 1024 channels of control, 1024 zones, 64 rooms, 512 presets, 62 button or button/fader stations and 6 Touchscreen Stations

E. ACP module electronics shall be convection cooled.

F. The ACP shall provide front-panel RJ45 jack, Secure Digital (SD) card slot, and Universal Serial Bus (USB) Port for configuration and data exchange.

G. Architectural Lighting System configuration and program information shall be stored in flash memory, which does not require battery backup.

H. The ACP shall be contained in a plug-in assembly and require no discrete wiring connections; all wiring shall be terminated into Dimming or Control Enclosure.

I. The ACP shall support the following communications:

01 Echelon LinkPower

02 10/100BaseTX, auto MDI/MDIX, 802.3af compliant Ethernet networking with TCP/IP, ESTA BSR E1.17 Advanced Control Networks (ACN) and ESTA BSR E1.31 (sACN) Protocols

03 EIA-232 serial protocol

04 ESTA DMX512A, configurable as input or output ports

05 Dry contact closure inputs

06 Dry contact closure outputs, rated at 1A@30VDC

2.4 ARCHITECTURAL CONTROL STATIONS

A. Function: The Unison Control System shall be designed to allow control of lighting and associated systems via Preset/Fader, Color Touchscreen, IR or Astronomical time clock controls.

B. System macros (sequences) shall be programmable via Light Designer system software.

01 Macro sequence steps shall include preset selection, wall status change, station property change (template), zone property change, timed delay, jump to macro, and stop macro.

02 Macro sequences shall be activated by button, time clock event or Light Designer software.

C. System time clock events shall be programmable via Light Designer system software, or via the dimmer rack processor front panel controls.

01 Time clock events shall be assigned to system day types. Standard day types include: any day, weekday, weekend, Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday. System shall support programming of additional custom or special day types.

02 Time clock events shall be activated based on sunrise, sunset, time of day or periodic event. System shall automatically compensate for regions using daylight savings time.

D. Station (Preset/Fader, Touchscreen, or IR) control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via Light Designer, the Windows-based configuration program.

01 Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate.

02 Optional fader functions include manual master control, individual zone control, fade rate control or preset master control.

03 Stations (Preset/Fader, LCD and IR) shall allow programming of station and component electronic lockout levels via Light Designer

E. 7” Touchscreen stations shall be 7”, WVGA (800x480) 24-bit color LCD touchscreen, fully configurable via Control Designer software.

01 Station finish shall be black/natural.

02 Station shall support up to 30 standard or custom graphical control pages with individual zone control, preset record and selection functions, room combine controls, custom function activation, and multi-level electronic lockout.

03 Configurations are loaded via SD card or USB key

04 Station shall contain a “color picker” screen, for end users to have the ability to quickly choose a color for color changing fixtures from all available colors using a simple graphic-based approach. Systems where only a certain number of preset colors are available to the end user are not acceptable.

05 Multi-level user lockouts with pin codes shall be available to grant various levels of access (as desired by owner) to playback, direct control, or recording functionality.

F. Paradigm Button and Button/Fader Stations shall operate using up to sixteen programmable faders and twelve programmable buttons.

01 All button/fader stations shall be available with white, cream, ivory, gray or black faceplates, fader knobs, and buttons.

02 Stations shall have indicators lights at each button or fader. Indicators shall be comprised of red, green and blue LED's. Indicator color and state (steady On, Blink, Off) shall be configured in software, and shall operate relative to the button or fader it is associated with.

03 All faceplates shall be designed for flush or surface mounting.

04 Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment. Faceplates shall be indelibly marked for each button or fader function.

G. Electrical

01 Unison control station wiring shall be an Echelon® Link power network.

02 Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or factory approved equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).

03 Touchscreen and Interface stations shall also require (2) #16 AWG stranded wires for 24Vdc operating power. 24Vdc wiring shall be topology free.

04 Network wiring may be bus, loop, home run or any combination of these.

2.5 DATA PLUG-IN STATIONS

A. Provide Data Plug in stations as indicated.

B. General

01 The Plug-in Stations shall consist of the appropriate connectors required for the functional intent of the system. These stations shall be available with DMX input or output, Remote Focus Unit, Network, or architectural control connectors. Custom control connectors shall be available.

C. Connector Options

01 The following standard components shall be available for Plug-in Stations:

a. 5-Pin male XLR connectors for DMX input

b. 5-Pin female XLR connectors for DMX output

c. 6-Pin female XLR connectors for RFU and ETCLink connections

d. RJ45 connectors for Network connections - Twisted Pair

e. 6-Pin female DIN connectors for Unison connections

f. DB9 female serial connector for architectural control from a computer

02 Custom combinations and custom control connections shall be available.

D. Physical

01 Station faceplates shall be .80" aluminum, finished in fine texture, scratch-resistant powder coat.

a. Faceplates shall be flush mounted.

b. Devices on the stage shall have a black powder coat with white silk-screened graphics.

c. Devices in the cafeteria shall have a stainless steel cover plate with black silk-screened graphics.

d. The station panel shall mount into an industry standard back box, depending on size and quantity of connectors. A terminal block shall be supplied for contractor terminations.

2.6 DISTRIBUTION

A. Connectors shall be available as 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A "U" ground (dual rated "T-slot"); other connectors shall be available as specified.

B. Pigtails shall be three-wire type "SOW" rubber jacketed cable sized for the maximum circuit ampacity.

C. Pigtails with 20 amp stage pin connectors shall be terminated using 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket.

D. Terminations for pigtail connectors shall utilize feed- through terminals individually labeled with corresponding circuit numbers. Terminals that place a screw directly on the wire are not acceptable.

E. Outlet and pigtail boxes shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings

F. A low voltage distribution system shall be available to incorporate DMX, Ethernet or other protocols as specified in the power distribution box. A voltage barrier shall be used to separate the low voltage wiring for the electrical circuits.

G. Power distribution equipment shall be listed by a nationally recognized test lab (nrtl).

H. Outlet and pigtail boxes shall be 6.25" H x 3.3" D and fabricated from 18 gauge galvanized steel and finished in black fine-texture powder coat paint. Covers shall be fabricated from 16-gauge galvanized steel

I. Outlet and pigtail boxes shall be available in any length specified in increments of 3-inches with a maximum length of up to 3-feet.

J. Pigtails and outlets shall be spaced on 18" centers, or as otherwise specified.

K. Outlets shall be mounted on individual 3" panels.

L. Circuits shall be labeled with 1.25” lettering.

M. Wiring devices shall be UL Laboratories Listed.

2.7 DMX REPEATER

A. The eDIN DMX/RDM Repeater Module shall permit star-wiring and repeating of DMX512 and RDM signals over the connected DMX cabling.

B. The Module shall fully isolate and protect DMX transmitters and receivers, and RDM controllers and responders from high common mode voltages, ground loop currents and other potentially damaging or disrupting electrical faults.

C. The Module shall have one input port, one pass-thru port and four output ports. All ports shall be bi-directional.

D. There shall be no in-line processing of the input signal, to ensure that all output signals are exact duplicates of the input signal with no processing delays.

E. The Module shall be designed to mount on standard 35mm DIN rail.

F. LED indicators shall be provided for Power, Data-In and CPU status, as well as for DMX/RDM activity on each of the four output ports.

G. The Module shall be capable of regenerating four (4) exact duplicates of the original source input signal. Each regenerated output signal shall have the same characteristics and capabilities of the input signal.

H. Each output shall be capable of driving up to 32 DMX/RDM responding devices over a maximum 300-meter (1000-ft.) length of cable.

I. One (1) DMX/RDM pass-thru port shall be provided. The pass-thru port shall be active, i.e. electrically repeated.

J. The Module itself shall act as an RDM responder.

K. It shall be possible to field-update the module firmware via the DMX/RDM input port.

L. Multiple modules, up to the RDM-specified limitation of four (4), may be cascaded (looped) on the same DMX/RDM input data line using the pass-thru port or any output port.

M. All DMX/RDM input and output ports shall be capable of withstanding short-term application of up to 250V without damage to internal components.

N. Port protection shall be self-healing, rated for 250V. Replaceable fuses shall not be acceptable.

O. The DMX input port shall provide 1500-volt optical isolation between the input signal wiring and output signal wiring.

P. DMX output ports shall be fully optically isolated from each other.

Q. The DMX/RDM Repeater module shall be designed to snap on to 35mm DIN rail without the use of tools.

R. The ambient operating temperature shall be -10° to 50°C (14° to 122°F).

S. The operating humidity shall be 5% - 95% non-condensing.

T. The DMX/RDM Repeater Module shall meet the requirements of USITT DMX512 (1990), ANSI E1.11 DMX512-A and ANSI E1.20 RDM.

U. The DMX/RDM Repeater Module shall be compliant with the EU RoHS (2002/95/EC) directive.

V. The DMX/RDM Repeater Module shall conform to all FCC and CE requirements.

W. The DMX/RDM Repeater Module shall be a Class 2 Low Voltage device.

2.8 PORTABLE THEATRICAL CONSOLE

A. The lighting control console shall be a microprocessor-based system specifically designed to provide complete intensity and color control of LED stage lighting systems. The console shall be the Colorsource 20 as manufactured by Electronic Theatre Controls, Inc.

B. The system shall provide control of a maximum of 20 LED fixtures on 512 DMX512 controlled addresses.

C. Physical features shall include:

01 A 7” integrated multi-touch display

02 4 configurable faders

03 20 dedicated faders

04 5 configurable softkeys for common commands

D. Controls shall include:

01 On board help functions and tutorial videos

02 Cue list record and playback functions

03 Non-intensity parameter control

04 Color, intensity, and parameter effects

05 5RDM discovery and configuration

06 Playback toy for live busking

E. 10 playback pages (200 total)

F. Color picker and other intuitive color controls shall be purpose built into the console controls to facilitate easy management of color changing LED fixtures.

G. Provide Pelican Case with Foam for the portable console.

2.9 COLOR MIXING LIGHT EMITTING DIODE PROFILE

A. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a ColorSource Spot as manufactured by Electronic Theatre Controls, Inc. or approved equal.

B. All LED fixtures shall be provided by a single manufacturer to ensure compatibility

C. The fixture shall be UL 1573 listed for stage and studio use

D. The fixture shall comply with the USITT DMX-512A standard

E. The unit shall be constructed of rugged, die cast aluminum, free of burrs and pits.

F. The following shall be provided:

01 Lens secured with silicone shock mounts

02 Shutter assembly shall allow for +/-25□ rotation

03 20 gauge stainless steel shutters

04 Interchangeable lens tubes for different field angles with Teflon guides for smooth tube movement

05 Sturdy integral die cast gel frame holders with two accessory slots, and a top-mounted, quick release gel frame retainer

06 Rugged steel yoke with two mounting positions allowing 300□+ rotation of the fixture within the yoke

07 Positive locking, hand operated yoke clutch

08 Slot with sliding cover for motorized pattern devices or optional iris

G. The housing shall have a rugged black powder coat finish

01 White or silver/gray powder coat finishes shall be available as color options

02 Other powder coat color options shall be available on request

H. Power supply, cooling and electronics shall be integral to each unit.

I. The unit shall ship with:

01 Theatrical-style hanging yoke as standard

02 5’ cable with Neutrik PowerCon™ to choice of connector as standard

03 Gate diffuser

04 A-size pattern holder

J. Available options shall include but not be limited to:

01 Bare-end, Stage-Pin or Twist-lock type-equipped power leads

02 PowerCon to PowerCon cables for fixture power linking

03 Smooth Wash Diffuser for overlapping beams of light from multiple fixtures

K. The light beam should have a 2-to-1 center-to-edge drop-off ratio

L. The unit shall provide, but not be limited to:

01 Low gate and beam temperature

02 Sharp imaging through a three-plane shutter design

M. The unit shall provide, but not be limited to:

01 5, 10, 14, 19, 26, 36, 50, 70 and 90 degree field angles

02 High-quality pattern imaging

03 Sharp shutter cuts without halation

04 Shutter warping and burnout in normal use shall be unacceptable

05 Adjustable hard and soft beam edges

N. 19, 26, 36, and 50 degree units shall have optional lens tubes available for precision, high-contrast imaging.

O. The fixture shall be ETL and cETL LISTED and/or CE rated, and shall be so labeled when delivered to the job site.

P. The fixture shall be ETL LISTED to the UL1573 standard for stage and studio use

Q. The fixture shall be rated for IP-20 dry location use.

R. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use

S. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.

T. The fixture shall be equipped with a 100V to 240V 50/60Hz internal power supply

U. The fixture shall support power in and thru operation

01 Power in shall be via Neutrik® PowerCon™ input connector

02 Power thru shall be via Neutrik ® PowerCon ™ output connector

03 Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker

V. Fixtures shall have droop compensation to prevent thermal shift of color or intensity

W. Power supply outputs shall have self-resetting current-limiting protection

X. Fixture shall be calibrated at factory for achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins

01 Calibration data shall be stored on the control card as a permanent part of on-board operating system

02 All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency

03 Fixtures not offering LED calibration shall not be acceptable

Y. The fixture shall utilize a minimum of 60 LED emitters

Z. The fixture shall utilize a selective mix of Red, Green, Blue and Lime emitters

AA. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming; Dimming curve shall be optimized for smooth dimming over longer timed fades.

BB. LED control shall be compatible with broadcast equipment in the following ways:

01 PWM control of LED levels shall be imperceptible to video cameras and related equipment

02 PWM shall be capable of being set via RDM to 25,000hz

CC. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors or RJ45 connectors

DD. The fixture shall be compatible with the ANSI RDM E1.20 standard

01 All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console

02 Temperature sensors within the luminaire shall be viewable in real time via RDM

03 Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible

EE. The fixture shall be equipped with a 7-segment display and a three-button user-interface

FF. The fixture shall be controlled via RGB data input

01 5-channel footprint (IRGBS)

GG. A variable-rate strobe channel shall be provided

HH. The fixture shall offer stand-alone functionality eliminating the need for a console

01 Fixture shall ship with 12 preset colors accessible as a stand-alone feature

02 Fixture shall ship with 5 sequences accessible as a stand-alone feature

03 Each color and sequence can be modified by the end user via RDM

04 Fixtures can be linked together with standard DMX cables and controlled from designated master fixture

05 Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming

06 Fixtures without stand-alone operation features described above shall not be acceptable.

2.10 COLOR MIXING LIGHT EMITTING DIODE WASH FIXTURE

A. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. The fixture shall be a ColorSource Par as manufactured by Electronic Theatre Controls, Inc. or approved equal.

B. All LED fixtures shall be provided by a single manufacturer to ensure compatibility

C. The fixture shall be UL 1573 listed for stage and studio use

D. The fixture shall comply with the USITT DMX-512 A standard

E. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits.

F. The housing shall have a rugged black powdercoat finish as standard. White and silver/gray shall be available as color options

G. Power supply, cooling and electronics shall be integral to each unit.

H. Fixture housing shall provide two easy-access slots for secondary lenses and other accessories. Slots shall be equipped with locking retaining clip

I. The unit shall ship with: Theatrical-style hanging yoke as standard. 5’ power lead with Edison connector as standard

J. Available options shall include but not be limited to:

01 Floor stand conversion Kit

02 Bare-end, Stage-Pin or Twist-lock type-equipped power leads

03 PowerCon to PowerCon cables for fixture power linking

04 Multiple secondary lens options to include multiple angles in the following patterns: Linear, Round, Oblong

K. Light output shall be via a round aperture. Aperture and accessory slots shall accommodate standard 7.5” accessories such as used in other similar-sized fixtures

01 Accessories available as options shall include but not be limited to: Gel/diffusion frames, Top hats, Barndoors, Egg crate louvers, Concentric ring louvers, Multiple secondary lensing options

L. The fixture shall be UL and cUL LISTED and/or CE rated, and shall be so labeled when delivered to the job site. The fixture shall be UL LISTED to the UL1573 standard for stage and studio use. The fixture shall be rated for IP-20 dry location use.

M. The fixture shall be cooled with a variable speed fan.

N. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use

01 Thermal management shall include multiple temperature sensors within the housing to include: The LED array and The control board

O. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.

P. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply

Q. The fixture shall support power in and thru operation

01 Power in shall be via Neutrik® PowerCon™ input connector

02 Power thru shall be via Neutrik ® PowerCon ™ output connector

03 Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker

R. Power supply outputs shall have self-resetting current limiting protection

S. Power supply shall have power factor correction

T. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.

U. LED emitters should be rated for nominal 20,000 hour LED life to 70% intensity

V. All LED fixtures (100% of each lot) shall undergo a minimum three-hour burn-in test during manufacturing.

W. Fixture shall be calibrated at factory for achieve consistent color between fixtures built at different times and/or from different LED lots or bins

01 Calibration data shall be stored in the fixture as a permanent part of on-board operating system

02 All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency

03 Fixtures not offering LED calibration shall not be acceptable

X. The fixture shall utilize an minimum of 40 LED emitters. These emitters shall be made up of Red, Green, Blue and Lime

Y. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.

Z. The dimming curve shall be optimized for smooth dimming over longer timed fades.

AA. LED control shall be compatible with broadcast equipment in the following ways:

01 PWM control of LED levels shall be imperceptible to video cameras and related equipment

02 PWM rates shall be adjustable by the user via RDM to avoid any visible interference to video cameras and related equipment

BB. The fixture shall be USITT DMX 512A-compatible via In and Thru 5-pin XLR connectors

CC. The fixture shall be compatible with the ANSI RDM E1.20 standard

01 All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console

02 Temperature sensors within the luminaire shall be viewable in real time via RDM

03 Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible

DD. The fixture shall be equipped with a 7-segment display for easy-to-read status and control and The fixture shall be equipped with a three-button user-interface

EE. The fixture shall offer RGB control

FF. The fixture shall operate in Regulated mode for droop compensation

GG. The fixture shall offer stand-alone functionality eliminating the need for a console

01 Fixture shall ship with 12 preset colors accessible as a stand-alone feature

02 Fixture shall ship with 5 Sequences accessible as a stand-alone feature

03 Each color and sequence can be modified by the end user

04 Fixtures can be linked together with standard DMX cables and controlled from designated master fixture

05 Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming

06 Fixtures without stand-alone operation features described in a, b, c, d, and e shall not be acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all new equipment and rewire existing equipment, all in compliance with national and local electrical codes. Auxiliary equipment required making this installation comply with codes, even if not listed in the specification, is the responsibility of the bidder and must be included in the bid price.

B. All wiring shall be done in a craftsman-like manner. When conductors must be spliced to extend length, it shall be done with a terminal strip or suitable type compression fittings.

C. Equipment shall be kept clear of all metal shavings, wire scraps, and miscellaneous trash. Any abandoned holes in the floor shall be patched.

D. Any existing conduit emanating from the floor shall be dressed in such a manner as to eliminate any trip hazard. Conduits shall be re-routed or terminated into wire-ways to insure a neat installation.

E. All equipment shall be installed in compliance with applicable local and national codes. It shall also be installed in accordance with the manufacturer's recommendations. Prior to initial energizing, a factory certified technician shall inspect the system and any errors shall be corrected.

F. Pipes positions shall be rigidly fixed, and conduit shall be flexible, following the hanging points. Conduit shall not obstruct the pipe: it shall be possible to add additional portable fixtures anywhere on the pipe position without obstruction.

G. Provide all lighting fixtures and accessories as indicated or required. All portable fixtures shall be unboxed, lamped, hung on pipe positions, tested, and focused for an even stage wash. Safety cables shall be installed around fixture yoke and pipe position. Data cables shall be installed to connect all fixtures to DMX as needed, with excess cable tied neatly to pipe.

H. Portable lighting console and cables shall be tested and provided for the system Energization and training and then turned over to the owner.

3.2 STARTUP AND PROGRAMMING:

A. System Startup: A manufacturer's factory authorized representative shall startup the theater lighting and controls after installation is complete and the pre-energization checks

have been completed.

B. Programming: After system startup is complete, the manufacturer's factory authorized representative shall set and program all lighting control devices, graphics and user interfaces as required for a complete and fully operational lighting control and monitoring system. System settings, programming, graphics and user interfaces shall be fully coordinated with the Owner and shall implement all controls, monitoring and interface requirements required by the Owner.

3.3 FACTORY COMMISSIONING:

A. Upon completion of the theater lighting and controls installation, the entire system shall be 100% commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system with all required programming and graphics.

B. The factory commissioning shall include, but not be limited to, the following services. Testing the dimming system and all track outlets, lighting, controls and control stations and all other components of the theater lighting and controls and providing initial programming for the theater lighting control system. Provide written or computer-generated documentation on the commissioning of the system.

C. Electrical Contractor is responsible for advance scheduling with the Theatrical Systems Contractor. Theatrical Systems Contractor shall be given at least four (4) weeks notice of request for system startup. Electrical Contractor is responsible for having all equipment installed and wiring pulled & terminated prior to the arrival of the Theatrical Systems Contractor Service Technician for commissioning.

D. At time of System Commissioning, Project Electrical Contractor is responsible for providing access to all low voltage termination points for termination and testing to the Service Technician. This includes lifts, ladders, and personnel required to reach any position the Service Technician needs access to. The electrical contractor shall provide at least (1) journeyman electrician, familiar with the installation of the system, dedicated to assisting the factory start-up technician for the entire duration of the commissioning process and for troubleshooting and any needed wiring changes, terminations, or testing. These personnel shall be made available whenever the service technician is on the job site.

E. 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.

3.4 IDENTIFICATION:

A. General: Refer to general electrical section for nameplates, identification and warning signs.

B. Boxes and Outlets: All theater lighting and control boxes and outlets shall be legibly labeled/marked with the panel and circuit numbers.

C. Conduit Identification: All conduits entering and exiting lighting theater system components and track outlets shall be clearly marked with the circuits contained in the conduit using a black permanent marker.

3.5 OPERATOR TRAINING:

A. System Training

01 Manufacturer shall provide factory authorized technician to train owner personnel

in the operation, programming and maintenance of the theatrical lighting system.

a. Reference 260010 Closeout Requirements.

02 Owner operation memo - Theatrical lighting control manufacturer shall prepare an operational manual for Owner to detailing the operation of their theatrical lighting system to be installed at the system cabinet.

3.6 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 260010 Closeout Requirements.

3.7 CLOSEOUT DOCUMENTATION

01 Reference 260010 Closeout Requirements.

3.8 RECOMMISSIONING

01 Reference 260010 Closeout Requirements.

3.9 WARRANTY

01 Reference 260010 Closeout Requirements.

END OF SECTION 26 55 61

SECTION 27 00 00 - GENERAL COMMUNICATION SYSTEMS REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT SUMMARY

A. Scope: Successful bidder shall provide, install, configure, and provide warranty service for technology systems described herein.

1.2 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

C. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

1.3 RELATED WORK

A. Section 27 00 10 – Communications Systems Closeout Requirements

B. Section 27 05 26 – Grounding and Bonding for Communications Systems

C. Section 27 05 28 – Pathways for Communications Systems

D. Section 27 10 00 – Communications Cabling General Requirements

E. Section 27 10 00 – Communications Cabling General Requirements

F. Section 27 11 00 – Communications Equipment Room Fittings

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 40 00 – AV/Multimedia General Requirements

L. Section 27 41 00 – Campus Multimedia Systems (CMS)

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

O. Section 28 05 44 – Emergency Responder Radio Antenna System

P. Section 28 10 00 – Physical Security General Requirements

Q. Section 28 13 00 – Security and Access Control System

R. Section 28 16 00 – Video Surveillance System

1.4 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. Consultant: Stanton Engineering Group.

E. Contractor: The qualified party responsible to provide all items and perform services as described within these documents. The Contractor referred to within a specific specification section shall be the successful qualified party contracted to perform and complete that work.

F. Documents: The complete package of Bid and Contract Requirements, General Technology Requirements, related Division 27 sections, drawings, schedules, and addenda that make up this Request for Bid.

G. End-User: Individual(s) who will ultimately operate the completed system.

H. ETR: Existing to Remain. Item is to remain in current location and maintain current functionality.

I. Furnish: To supply and deliver to project site, ready for installation.

J. Install: To place in a position of service or use.

K. NIC: Not in Contract. Item will be the responsibility of others.

L. Notice to Proceed: Formal communication from Owner to Contractor stating the date the Contractor can begin work subject to the conditions of the contract. The performance time of the contract starts from the Notice to Proceed date.

M. OFCI: Owner Furnished Contractor Installed. Item will be provided by Owner and shall be installed by Contractor.

N. OFE: Owner Furnished Equipment. Item will be provided and integrated by Owner.

O. OFOI: Owner Furnished Owner Installed. Item will be provided and installed by Owner.

P. Owner: The party named in the Procurement and Contract Requirements as the advertising party.

Q. Provide: To furnish and install, complete and ready for intended use.

R. Turnkey: Of or involving the provision of a complete product or service that is ready for immediate use.

S. Work: The provision of products and/or services to meet the requirements specified in these documents.

1.5 REFERENCE STANDARDS AND CODES

A. Standards and other procedures referenced by this bid package are as follows:

01 ADA–Americans with Disabilities Act of 2010 www.ada.gov/2010ADAstandards_index.htm

02 AIA – American Institute of Architects www.aia.org

03 ANSI – American National Standards Institute www.ansi.org

04 ASHE – American Society of Healthcare Engineering www.ashe.org

05 ASTM – American Society of Testing and Materials www.astm.org

06 BICSI – Building Industry Consulting Service International, Inc. (RCDD Standards) www.bicsi.org

a. BICSI TDM, Cabling Installation, LAN Design, and Customer-Owned Outside Plant Manuals

b. BICSI Electronic Safety & Security Design Reference Manual

07 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)

08 U.S. Copyright Law, December 2011 www.copyright.gov/title17

09 ECIA – Electronic Components Industry Association ESC – EIA Standards Council www.eciaonline.org

10 IACS – International Annealed Copper Standard www.ndt-ed.org/GeneralResources/IACS/IACS.htm

11 IEC – International Electrotechnical Commission www.iec.ch

12 IEEE – Institute of Electrical and Electronics Engineers standards.ieee.org

13 ISO – International Organization for Standardization www.iso.org

a. International Standards Organization/International Electrotechnical Commission (ISO/IEC) IS 11801 Generic Cabling for Customer Premises

14 ITU-T – International Telecommunication Union – Telecommunication www.itu.int

15 NEC – National Electrical Code (NFPA 70)

a. maintained by NFPA – National Fire Protection Association www.nfpa.org

16 NECA – National Electrical Contractors Association www.necanet.org

17 NEMA – National Electrical Manufactures' Association www.nema.org

18 OSHA – Occupational Safety and Health Administration (U.S. Department of Labor, OSHA) www.osha.gov

19 TIA – Telecommunications Industry Association www.tiaonline.org/standards

a. ANSI/TIA 568.0-E Generic Telecommunications Cabling for Customer Premises

b. ANSI/TIA 568.1-E Commercial Building Telecommunications Infrastructure Standard

c. ANSI/TIA-568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components

d. ANSI/TIA-568.3-E Optical Fiber Cabling and Components

e. ANSI/TIA-568.5 Balanced Single Twisted-pair Telecommunications Cabling and Components Standard

f. ANSI/TIA 569-E Commercial Building Standard for Telecom Pathways and Spaces

g. ANSI/TIA 606-D Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

h. ANSI/TIA-607-E Generic Telecommunications Bonding and Grounding for Customer Premises

i. ANSI/TIA-758-B Customer-Owned Outside Plant Telecommunications Infrastructure Standard

j. ANSI/TIA-4966-ATelecommunications Infrastructure Standard for Educational Facilities

k. ANSI/TIA-5017 Telecommunications Physical Network Security Standard

20 UL – Underwriters' Laboratories www.ul.com

21 Local Governing Authorities Having Jurisdiction

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.

1.6 QUALIFICATIONS

A. Refer to related sections for specific requirements.

1.7 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 is in compliance with 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.

1.8 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.

1.9 PRODUCT SUBSTITUTION PROCEDURES

A. Requests for Substitutions: Should the Contractor request a change in the material that is to be supplied, from that which was specified in the contract, the Contractor shall provide the Owner and the Consultant with a written request for said change.

B. Substitutions for Non-specified Products: Where no product specification is provided, Contractor may use manufacturer's specification for the identified product as a guide for suggesting appropriate substitutions.

C. Requirements: The Request for Substitution shall include:

01 Reason for substitution.

02 Material data sheets for both the proposed item(s) and the item(s) to be replaced.

03 Any cost impact to the Owner.

D. Changes: Proposed changes to Contract Documents shall be clearly identified in the pre-construction submittals.

E. Approval: The Owner may approve or deny any Requests for Substitution. The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specifications. The Contractor shall not procure any substitute materials until the Owner has approved and signed the Request for Substitution and passed copies to the Contractor and the Consultant. Any procurement or work performed prior to this approval is at the Contractor's own risk.

F. Deviation: Products provided or installed that deviate from the products specified in make, model, color, or other significant characteristic (i.e., non-approved substitutions) shall be removed and replaced with specified products at no additional expense to Owner.

1.10 SOFTWARE

A. Versions: Consultant used the following software versions for this project:

01 Autodesk Revit MEP 2021 (floor plans)

02 Autodesk AutoCAD MEP 2021 (detail sheets)

1.11 SUBMITTAL CONDITIONS

A. The Contractor shall not consider the Consultant or Owner's review of submittals to be exhaustive or complete in every detail. Approval of shop drawings or submittals including substitutions indicates only the acceptance of the Contractor's apparent intent to comply with general design or method of construction and quality as specified. The finished product shall meet functional requirements, operations, arrangements, and quantities and comply with the contract documents unless specifically approved otherwise.

B. The Contractor shall be held responsible for delivery of systems as specified. Any errors or omissions in the submittals shall not relieve Contractor of responsibility to deliver complete systems as specified.

1.12 PRE-CONSTRUCTION PROCEDURES

A. Pre-Construction Submittal Meeting: Contractor shall schedule web conference (WebEx or similar) with Consultant to review basis of design and submittal expectations.

B. Prior to Work: Pre-construction submittals shall be provided to Consultant with appropriate promptness as to cause no delay to the work.

C. 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.

D. Format and Distribution: Contractor shall provide one (1) electronic copy in PDF format to Consultant of all pre-construction submittals.

E. Provision: Contractor shall submit pre-construction submittals including any corrections or additions to Consultant prior to the procurement of equipment or commencement of work.

F. Review: Pre-construction submittals shall be received and formally approved by Consultant prior to the procurement of material or the commencement of work. Any procurement or work performed prior to this approval is at Contractor's own risk.

G. Failure to Provide: The failure of Contractor to provide pre-construction submittals as required herein may result in the withholding of payment for work and/or the cancellation of

the contract.

1.13 PRE-CONSTRUCTION SUBMITTALS

A. Pre-construction submittals are intended to document the details of installation. Exact copies of original drawings and specifications are not acceptable as pre-construction submittal drawings. Consultant schematic diagrams describe the basis of design as defined herein.

B. Contractor shall provide to Consultant the following pre-construction submittals for approval in addition to specific requirements identified in subsequent sections.

01 Qualifications: Shall include documentation of all required qualifications.

02 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, cable routing, device addresses, Contractor provided equipment, 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.

03 Product Data:

a. Equipment Schedules: Shall include manufacturers, part numbers, quantities, spares, 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.

04 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.

1.14 CONSTRUCTION PROGRESS PROCEDURES

A. Meeting Attendance: Contractor is required to attend job progress meetings in accordance with requirements set by Owner or Consultant.

B. Additional Coordination: Contractor shall request additional job construction coordination meetings it deems to be necessary to ensure coordination of their responsibilities with other parties.

C. Progress Inspection: Consultant may perform periodic progress inspections. At Consultant’s

request, Contractor shall make Project Manager and/or Lead Technician available.

D. Test Plan: Ten (10) business days prior to the proposed Contractor test date, Contractor shall provide a test plan defining the tests required.

01 The test plan shall be approved by Consultant prior to any testing.

1.15 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.

01 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.

02 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.

C. Failure to Complete: Failure to complete requested construction progress documentation may result in the withholding of payment by Owner.

1.16 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.

01 Test Results

02 As-built drawings (full-size sheets)

03 Operation and Maintenance Manuals

04 End User Software

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 to Consultant and Owner 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 with a minimum charge of $500 per visit.

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.

01 Record Drawings – AutoCAD 2010 editable .dwg format AND PDF.

02 Operation and Maintenance Manuals – USB Flash Drive, CD, OR DVD.

03 End User Software – USB Flash Drive, CD, OR DVD.

04 Documentation of testing and system certification.

H. Closeout Submittal Format and Distribution: Upon approval of closeout submittals and prior to final acceptance, Contractor shall provide a total of three (3) bound hard copies with labeled dividers of all record drawings (full- size sheets) and operation and maintenance manuals, two (2) copies to Owner and one (1) copy to Consultant. Title on front and spine of binder shall be “Operation and Maintenance Manual – Cloverleaf Elementary Replacement”. The following additional items shall be identified on the binder cover:

01 Client Name

02 Contractor Name and Contact Information

03 Consultant Name and Contact Information

04 Date

I. All documentation prepared by the Contractor, including hard copy and electronic forms, shall become the property of the Owner.

J. 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 Owner and Consultant, including punch list(s) and/or re-inspection(s) and delivery of closeout deliverables.

1.17 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.

01 As-built drawings: As-built drawings are prepared by the Contractor. They show, in red ink, on-site changes to the Consultant-approved pre-construction submittal documents. As-built drawings shall be submitted to Consultant for approval prior to submitting record drawings and include:

a. Changes made by Addenda, Change Orders, Requests for Information (RFIs), Architect’s Supplemental Instruction (ASIs), or Requests for Proposal (RFPs) in addition to any other changes to the original documents.

b. Actual device locations, conduit routing, wiring and relationships as they were constructed.

c. Nomenclature showing as-built wire designations and colors.

d. Room numbers coinciding with Owner space planning numbering.

02 Record drawings are the final drawings prepared by the Contractor and incorporate all as-built drawing changes previously approved by Consultant. Record drawings should be electronically produced without any handwritten, red ink, or clouded changes.

03 Operation and Maintenance Manuals: Notwithstanding requirements specified

elsewhere, submit one (1) copy of each of the following per binder:

a. A final Bill of Materials for each system.

b. IP and MAC Addresses for any device that resides on the network.

c. Usernames and passwords by device for all applicable products.

d. Manufacturers Instruction Manuals: Specification sheets, operation manuals and service sheets published by the manufacturers of the components, devices and equipment provided.

e. Information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.

f. Replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.

g. Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.

h. Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturers' Warranty Registration papers as described herein.

i. Sufficient information, (detailed schematics of subsystems, assemblies and subassemblies to component level) clearly presented, shall be included to determine compliance with drawings and specifications.

j. Any other items defined herein.

04 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.

05 Intellectual Property: Provide all required items and written release as described herein.

06 Training Program: Proposed training materials and program outline.

07 Spare Parts and Remote Controls: Contractor shall submit record of Owner sign-off of turnover of spare parts and remote controls.

1.18 PROJECT MANAGEMENT

A. Project Manager: Contractor shall appoint a Project Manager who will be the main point of contact for Owner and Consultant regarding the project.

B. Responsibility: Project Manager is responsible for the following:

01 Successfully completing the contract in a timely manner.

02 Overseeing work and performance of all employees and Subcontractors who have been hired by Contractor and ensuring compliance with specification.

03 Completing and submitting required documentation.

04 Attending project coordination meetings as required by Owner, Consultant, and Contractor. Contractor is responsible for taking minutes of these meetings and distributing copies to all participants.

05 Coordinating with Owner, Consultant, Architect, General Contractor, and other Contractors involved in the project to ensure smooth flow of work and on-time project completion.

06 Providing a written weekly progress update to the Owner and Consultant in a PDF format emailed to the project team.

07 Reporting all unexpected conditions and problems that may result in delay or expense to Owner and Consultant immediately upon discovery.

C. Change of Project Manager: If Contractor seeks to change Project Manager during the course of the Project, such change is subject to prior written approval from Owner.

D. The Owner reserves the right to request a change of project manager at any time for any reason.

1.19 EXAMINATION OF EXISTING CONDITIONS

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…) 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 report these to Owner in a timely manner.

D. Pre-Existing Damage: If Contractor observes damage to finished surfaces before they begin installation in any area, Contractor shall document by taking digital photos of the damaged area(s) and immediately notifying Construction Manager and Consultant via email, with attached photos.

E. Damage during Installation: Any damage caused by, or reasonably believed by the Construction Manager to be caused by the Contractor shall result in back-charges for said damages. Repairs shall match preexisting color and finish of walls, floors, and ceilings. Any Contractor damaged ceiling tiles, floor, and carpet shall be replaced to match color, size, style, and texture.

1.20 CONTRACT MODIFICATION PROCEDURES

A. Changes: Changes to the contract may be initiated by Owner, Consultant or Contractor.

B. Request for Information (RFI): If a change originates with Contractor, the Contractor shall submit an RFI for Consultant review. If it is deemed a change is necessary, the Consultant shall issue a PR to address the change.

C. Proposal Request (PR): If a change originates with Owner or Consultant, Consultant shall issue a Proposal Request to Contractor.

D. Change Proposal (CP): If a change originates with Contractor, or if Contractor receives a Proposal Request from Consultant, Contractor shall submit a Change Proposal to Consultant to review.

01 References: A Change Proposal shall reference the work to be performed, and shall include the cost change to the Project (if any) and the time change to the scheduled completion (if any)

E. Cost/Time Changes: A Change Proposal shall reference the work to be performed, and shall include the cost change to the project (if any) and the time change to the scheduled completion (if any).

F. Additional Information: Consultant may request additional information to be supplied with the Change Proposal for consideration.

G. Acceptance: Owner reserves the right to accept or reject Change Proposals.

H. Change Order: A Change Order is a modification of the contract:

01 If a Change Order is approved, Owner will issue a Change Order that references PR and/or CP. Change Order is not valid until it has been signed by Owner.

02 Work performed or equipment supplied outside of contract without a valid Change Order is done at Contractor's own risk.

1.21 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Storage: Storage of materials shall remain the full responsibility of Contractor until Acceptance.

B. Protection: Contractor shall take all necessary precautions to protect materials from the following:

01 Theft

02 Vandalism/Tampering

03 Dents

04 Scratches

05 Dust

06 Temperature

07 Weather

08 Cutting

09 Paint

10 Other hazardous conditions

C. Replacement: Contractor shall replace any damaged or lost material as required by Owner or Consultant.

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.

1.22 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.

1.23 ON-SITE CONDUCT

A. Conduct: Any demonstration of rudeness, use of profanity, or lack of respect by Contractor Personnel to a building tenant will be cause for immediate removal from the premises, and such Personnel will not be allowed to return. Contractor and Contractor's Personnel are to remain in project area.

B. Vandalism: Graffiti or vandalism will not be tolerated. Any Contractor/Personnel caught in the act shall be immediately removed from the premises and will not be allowed to return.

C. Hazardous Conditions: No one shall be allowed to endanger the building, its premises, and its occupants in any manner whatsoever. In the event that a situation occurs which threatens the building or its occupants in any manner, Contractor, Contractor Personnel, Subcontractor, etc. shall take steps to correct hazardous condition. In the event that Contractor's Personnel fail to correct hazardous condition, Owner reserves the right to immediately take steps to correct the situation at Contractor's expense.

1.24 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.

1.25 OWNER-FURNISHED PRODUCTS

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.

1.26 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.

1.27 QUALITY CONTROL

A. Installation: During installation period, when connections are made to the Owner's existing infrastructure, Contractor shall use care to ensure that no negative results occur that could reduce or hamper existing systems.

1.28 OWNER'S RIGHT TO USE EQUIPMENT

A. The Owner reserves the right to use equipment, material and services provided as part of this work prior to Acceptance of the Work, without incurring additional charges and without commencement of the Warranty period.

1.29 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 USB flash drive, 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

2.1 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.

2.2 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.

2.3 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.

01 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.

02 Restricted Access Areas: Philips head screws may be used where a secure room entrance or locked rack/console door prevents public access.

2.4 POWER DEVICES

A. Power Strips: Unless otherwise specified, power strips shall be UL listed, surface mounted, rated for 20 amp continuous electronic loads. Outlets shall be 125 volt, 20 amp, three-wire, grounded, NEMA 5-20R. 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, NEMA 5-20R. 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.

2.5 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.

2.6 CABLE MANAGEMENT

A. Plastic Cable Ties: Single use white nylon plastic cable ties, appropriate screw fittings, or mounting clips may be used for AC power cable management within racks and enclosures. Plastic/nylon cable ties shall not be used for signal and DC cables.

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.

2.7 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.

2.8 GROUNDING HARDWARE

A. Refer to Section 27 10 05 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.

2.9 FIRE STOPPING MATERIALS

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. The Contractor is responsible for adhering to the following standards:

01 Conduit penetrations through fire-rated or smoke walls: Completely seal around the conduit penetration with Hilti FS 601 fire-rated sealant Tremco or 3M or equal.

02 Conduit sleeves through fire-rated or smoke wall: Completely seal around the conduit penetration with Hilti FS 601 fire-rated sealant Tremco or 3M or equal. Completely seal inner opening of the conduit sleeve with fire wool packing and Hilti FS 611A intumescent firestop sealant.

03 Cable bundles through fire-rated or smoke walls (without sleeves): Completely seal openings with Hilti FS 611A intumescent firestop sealant, Tremco or 3M or equal.

04 Cable tray penetrations through fire-rated or smoke walls: Completely seal openings with Hilti FS 635 (trowelable type), Tremco, 3M or equal.

C. A submitted response to this specification assumes that all firestopping will be provided as specified. The firestop manufacturer’s specifications and instructions shall be submitted with the final documentation.

2.10 COMPATIBILITY OF RELATED EQUIPMENT

A. Existing Equipment: Equipment and systems specified in these documents shall be assumed to be compatible with the systems already installed at Owner site(s) and as identified in this document as related to this project.

B. 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 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.

2.13 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

3.1 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 turnkey solution.

3.2 COORDINATION

A. General: Contractor shall cooperate with other Contractors for proper provisioning, anchorage, placement, and execution of all work. Interference between the work of various Contractors 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.

01 Work by General Contractor.

02 Work by other Technology Contractors.

03 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 with General Contractor its 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 with General Contractor its requirements for proper grounding and bonding to their equipment.

G. Surface-Mounted Raceway Coordination

01 General and Electrical Contractors: Contractor shall coordinate with General Contractor and Electrical Contractor the installation of surface-mounted-raceway

where not provided but made necessary by non-penetrable wall.

02 Verification: Contractor shall field verify and coordinate the proposed use of surface-mounted raceway at any location with Consultant and Owner.

3.3 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 operation 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 the shielding of 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. 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. 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.

01 Cleaning of cables or equipment with harsh chemicals 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 no additional cost to the project.

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 as determined and directed by General Contractor or Owner.

G. Dumpsters: No construction debris shall be placed in building's dumpsters. Contractor shall provide a dumpster for construction waste and debris at own expense. Said dumpster shall be emptied on a regular schedule. Location of dumpster shall be arranged through Building Management.

H. Ceiling Grid: Contractor shall not hang cable supports from ceiling grid wire.

I. Roof Deck: Contractor shall not shoot into the roof deck for mounting cable hangers.

J. Mounting: Equipment and enclosures shall be mounted plumb and square in relation to the structure.

K. Raised Floor: All cabling installed below the raised floor shall be placed in the provided cable trays with appropriate means to hold cable in place. If no cable tray exists, Contractor shall provide J-hooks to hold cables in place. Sleeves shall be utilized for cable egress.

L. Motorized Furniture: Care shall be taken to properly dress all cables placed within motorized furniture and provide sufficient cable length to allow motorized elements to operate within their full range of travel.

3.4 PREPARATION

A. Existing Equipment: Prior to any installation, the Contractor shall 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, Contractor shall ensure that required major equipment has been secured and is ready for installation.

3.5 CLEANING

A. Tool Clean-up: Contractor is not permitted to use restrooms for tool clean-up. A slop-sink may be provided in janitorial closet on each floor for cleaning of tools and equipment and as a source of water. Janitorial closet or maintenance area or shop shall be kept clean at all times. Contractor or Contractor's Personnel found using restrooms for clean-up or other similar purposes shall be subject to removal from building.

B. Daily: At the end of each work period or day, Contractor shall remove excess packing, drilling remnants, and other non-equipment related parts, materials, or debris to ensure a clean, safe, and professional working environment.

C. Carpet: Contractor shall ensure that no damage to carpeting occurs as a result of their work. Contractor shall cover carpets in areas of work to prevent wire debris from entering the carpet.

3.6 FIRE STOPPING

A. Contractor is responsible for applying fire-stopping material in and around all openings that it creates or are created for it, whether or not 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.

3.7 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.

3.8 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.

3.9 INSTALLATION REQUIREMENTS

A. 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.

B. 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.

C. 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.

D. All cable shall be free of tension at both ends.

E. PLENUM rated cable shall be used in areas used for air handling.

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. Lubricant shall 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.

3.10 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

01 Voice, data, and other twisted pair cables: No splices shall be installed in any voice, data or twisted pair cables.

02 Technology systems: No splices shall be installed in any cable less than five hundred feet in length.

03 Digital multimedia/video cables: No splices are allowed in any digital multimedia/video cable.

04 Overhead paging systems: Cable splices for constant voltage overhead paging system shall occur only at speaker, amplifier or volume control knob locations.

C. Lengths

01 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.

02 Labeling: Cables, regardless of length, shall be marked with a labeling scheme approved by Consultant.

03 Grouping: Cables shall be separated into like groups according to signal or power levels.

04 Power cables: Power cables shall be grouped to one side of the equipment rack while low-level cables to the other side.

05 Equipment Racks: Equipment rack wiring and cabling shall be neatly dressed.

06 Fastening: Rack cabling shall be adequately supported with Velcro wire wraps and horizontal support cable managers fastened to rack frame.

07 Wire Support outside MER/TR Spaces: Wire and cables shall be supported at least every 5 feet from the structure or as required to maintain not more than a 12 inch cable sag between supports and without over tensioning the cables.

08 Support 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.

09 Right Angles: Cables are to run at right angles to the structure, placed above ceiling in halls or corridors.

10 Height: Cables shall not run above red iron joist.

D. 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.

E. 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.

F. Cable Ties and 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. Cable ties shall only be used for non-signal carrying cables. No sharp burrs shall remain where excess length of the cable tie has been cut.

G. Obstruction: Contractor shall notify Owner immediately if any obstruction or hazard is discovered in a pathway provided by others.

3.11 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.

3.12 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.

3.13 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, follow industry best practices and locate operable devices at convenient positions; heat generating devices at the top and seldom-accessed equipment below.

01 Unless otherwise specified, end user-operable devices shall be positioned within the range of front wheelchair access per ADA standards.

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.

3.14 FIRMWARE

A. Firmware shall be latest version supported by software and/or equipment as of Date of Acceptance.

3.15 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 due to plastering, painting, cleaning, or other such work.

3.16 CUTTING, DRILLING, PATCHING, AND PAINTING

A. Coordination: Contractor is responsible for coordinating the work when any cutting or drilling is required in the performance of installing the specified systems.

B. Restoration: Contractor is responsible for returning all surfaces (including walls, floors, and ceilings) to their previous condition after any cutting.

3.17 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 to Consultant 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:

01 Like Size: Labels shall be sized to match other labels used for same purpose. Similarly, provide engraved labels of like size in other locations.

02 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."

03 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.

04 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.

05 Documentation: Labeling information shall appear on the as-built drawings.

3.18 DEMOLITION

A. General: Where demolition is indicated in Project Documents, Contractor shall be responsible for removal, collection, transportation, and recycling of all indicated cabling and components, including the delivery of cable to the recycling center. If material is to remain on site for more than seven days after removal, Contractor shall coordinate with Owner for acceptable storage location.

B. Verification: Contractor shall field-verify existing conditions prior to beginning demolition work. Any discrepancies between existing conditions and Owner's written instructions shall be reported to Owner 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. Cable Removal: Where it is not possible to remove cables without damaging other cables that are to remain, such as in a shared conduit, Contractor shall cut cables at entry and exit point of constriction, leaving a minimum of 24" of cable at each end.

D. Cover Plates: Contractor shall provide and install blank cover plates for any outlets 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.

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 ADDITIONAL ENGINEERING SERVICES

A. General: Contractor is responsible for securing necessary engineering services where needed to meet the needs of the installation.

B. Change Orders: Only when Contractor can show that additional engineering services are needed as a result of changes to the scope of the services being requested will Owner entertain a Change Order for these services.

3.21 GENERAL TESTING

A. See more specific/detailed testing requirements listed in each system subsection.

B. Supplies: Contractor shall supply testing equipment needed to verify compliance with specifications found in these documents.

C. Program: Contractor shall complete required testing prior to the 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 any active systems, ensure the following:

01 Installation: Products are installed in a proper and safe manner per the manufacturer's instructions.

02 Cleanliness: Products are neat, clean, and unmarred and parts securely attached. Dust, debris, solder, splatter, etc., is removed.

03 Cables and Connections: Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

04 Grounding: Electronic devices are properly grounded.

05 AC Power: Each AC power receptacle is tested with a circuit checker for proper hot, neutral, and ground connections prior to plugging in equipment.

3.22 GROUNDING

A. All systems shall be grounded per manufacturer recommendations.

B. Refer to Section 27 05 26 for specific Telecom Grounding and Bonding installation requirements.

3.23 TRAINING PROGRAM

A. Contractor shall provide the following training in addition to specific requirements identified in subsequent sections.

B. Minimum 8 hours of training on each system.

C. Training shall include operations manual at time of training.

D. Provide audio-video recording of each training session to Owner.

E. Prior to scheduling or delivering End-User training, confirm:

01 Closeout submittals have been accepted by Owner and Consultant.

02 Final closeout inspection has been completed and punch list items corrected.

03 Training schedule dates must be coordinated and approved with the Owner and Consultant.

F. Training shall include:

01 Approved handouts.

02 Practical and comprehensive operation of systems.

03 Basic system troubleshooting techniques.

04 Basic system maintenance.

G. Training Blocks

01 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 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.

02 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. The 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. The 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. The 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 that will provide instruction to other users and will include Advance System Configuration and Operational Knowledge needed to maintain and manage all 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.

H. 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 will receive training credit.

3.24 WARRANTY AND MAINTENANCE PROGRAM

A. Contractor shall provide the following warranty in addition to specific requirements identified in subsequent sections.

B. As part of the base proposal cost, the Proposer shall include a 1-year, turnkey warranty period with full support costs.

01 Years two through five shall be itemized on the Proposal form unit pricing form as these will be funded out of operational funding sources.

C. The Warranty period shall begin once the system is complete and all punch list items are confirmed as being complete per the construction documents. The Contractor shall receive a letter of completion from the Consultant and Owner once the project is complete 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:

01 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.

02 Regular Service, Emergency Service, and Normal Service.

03 Labor, travel, equipment, materials and transportation cost.

E. Response Time: Response time for service calls.

01 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.

02 Emergency service calls are defined as failures that prohibit the use of a typical system function(s) that pose a life safety concern or such failures that create 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.

03 Normal service calls are defined as failures that prohibit the use of typical system function(s) that 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.

04 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 need warranty service

F. Repair Time: Contractor shall locally stock critical parts in sufficient quantities such that emergency 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 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: 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.

I. Subcontracting: Warranty service work may not be subcontracted except with specific permission and approval by the Owner.

01 Service/Warranty Procedures: With project close-out submittals, the Contractor shall submit a warranty service plan with all contact information and Owner service call directions for Owner review.

J. Resolution of Conflicts

01 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.

K. 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.

END OF SECTION 27 00 00

SECTION 27 00 10 - COMMUNICATIONS SYSTEMS CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

1.2 RELATED WORK

A. Section 27 00 00 – General Communication Systems Requirements

B. Section 27 05 26 – Grounding and Bonding for Communications Systems

C. Section 27 05 28 – Pathways for Communications Systems

D. Section 27 10 00 – Communications Cabling General Requirements

E. Section 27 11 00 – Communications Equipment Room Fittings

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 – Campus Multimedia Systems (CMS)

L. Section 27 41 50 – Local Sound Systems

M. Section 27 51 00 – Campus Communications Systems

PART 2 - MATERIALS AND METHODS

2.1 CLOSEOUT REQUIREMENTS

A. AS-BUILT DRAWINGS: 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.

B. CLOSEOUT MANUALS: At completion of job, furnish three copies of spare parts lists, operating instructions, product cutsheets, test results, manufacturer's studies/settings/reports and as-builts for all equipment furnished under this Division.

These lists and instructions shall be published by the manufacturer of the equipment. Bind in 3-ring binders with project name. Provide a USB flash drive with a digital copy of complete closeout manual with each binder.

01 DOCUMENTATION:

a. Division 26:
   (i) Refer to Division 26 sections.

b. Network Cabling and Infrastructure
   (i) Complete device and equipment documentation.
   (ii) User manuals.
   (iii) As-built drawings indicating device layout, wiring, and equipment connections in CAD format.
   (iv) As-built drawings indicating device layout, wiring, and equipment connections in PDF format.
   (v) Detailed test results in original tester format (Fluke Linkware)
   (vi) Detailed cable test results in PDF format
   (vii) Final rack elevation diagrams
   (viii) Pictures of each TR including front and back of rack/cabinet elevations
   (ix) Warranty information.
   (x) Warranty certification from connectivity manufacturer

c. Campus Multimedia Systems
   (i) Complete device and equipment documentation.
   (ii) System programming in unlocked format.
   (iii) User manuals.
   (iv) Test data.
   (v) As-built drawings indicating device layout, wiring, and equipment connections.
   (vi) System certification.
   (vii) Warranty information.

d. Local Sound System
   (i) Complete device and equipment documentation.
   (ii) System programming in unlocked format.
   (iii) User manuals.
   (iv) Test data.
   (v) As-built drawings indicating device layout, wiring, and equipment connections.
   (vi) As-built rack layouts
   (vii) System certification.
   (viii) Warranty information.

e. Campus Communication System
   (i) Complete device and equipment documentation.
   (ii) User manuals.
   (iii) Test data.
   (iv) As-built drawings indicating device layout, wiring, and equipment connections.
   (v) As-built rack layouts
   (vi) System certification.
   (vii) Warranty information.

f. Division 28:
   (i) Refer to Division 28 sections.

02 TRAINING SESSIONS:

a. Provide digital copy of training materials and each recorded training session with digital turnover documents.

03 TESTING:

a. 270526 – Telecommunications Grounding/Bonding Test Report
b. 271000 – Cable Test Reports
c. 274100 – Audibility Test Report

04 SPARE PARTS:

a. Deliver all spare parts and loose items to the Owner at the end of the project. Provide a spare parts list and signed transmittal listing all items with closeout documentation.

05 WARRANTY:

a. Provide manufacturer's warranty information, including any extended warranties included in the project.
b. Provide warranty letter from each contractor and sub-contractor.
c. Provide copy of extended service contracts, if any, included in the project.

2.2 GUARANTEES, WARRANTIES, AND SERVICE CONTRACTS

A. GENERAL FOR COMMUNICATIONS SYSTEMS: 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.

B. STRUCTURED CABLING:

01 Provide twenty-five (25) year manufacturer warranty.

2.3 SPARE PARTS

A. GENERAL: 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. Include a spare parts list and signed transmittal with closeout documents.

B. Reference individual specification sections for additional information.

C. DIVISION 26:

01 Refer to Division 26 sections for additional information.

D. NETWORK CABLING AND INFRASTRUCTURE

01	Data Drops	Twenty-Five (25)

a. Include up to 300ft of horizontal cabling, hangers, patch cords, etc. for a complete installation end to end for each data drop.
b. Division 26 to include up to 20ft of conduit, j-boxes, protective bushings, etc. for each drop as required for a complete install.

02	Data Outlet	Twenty (25)
03	6-Port Faceplate	Twenty (25)
04	Patch Cords	Reference 271600

05 In-Line Cabling Surge Protector — Five (5)

06 Keys (per lockable equipment/device) — Five (5)

E. CAMPUS MULTIMEDIA SYSTEMS

01 Each Classroom shall receive the following patch cords:
- a. 10’ HDMI 2.0 cable — One (1)

02 Each Conference Room shall receive the following patch cords:
- a. 10’ HDMI 2.0 cable — One (1)

03 The stage shall receive the following patch cords:
- a. 15’ HDMI cables — Two (2)
- b. Audio cables to connect Owner’s devices to input plates.

04 Provide the following spare cabling and equipment:
- a. 15ft HDMI 2.0 Cables — Ten (10)
- b. TopCAT Sharemikes — Ten (10)

05 Projector lamps and filters:
- a. Projector lamps per CFCI projector — One (1)
- b. Filters per CFCI projector — One (1)

06 Remote Controls: Contractor shall turnover all remote controls, with batteries installed, to Owner upon project completion.

07 Keys: Contractor shall turnover all keys, tagged and organized by type on individual key rings, to Owner upon project completion.

08 Reference drawing details for additional spare requirements.

F. LOCAL SOUND SYSTEMS

01 Remote Controls: Contractor shall turnover all remote controls, with batteries installed, to Owner upon project completion.

02 Keys: Contractor shall turnover all keys, tagged and organized by type on individual key rings, to Owner upon project completion.

03 Reference drawing details for additional spare requirements.

G. CAMPUS COMMUNICATIONS SYSTEMS

01 Spares w/ Installation:
- a. 2x2 lay-in ceiling speakers — Five (5)
- b. Call Buttons — Five (5)
- c. Volume Control Switches — Two (2)
- d. Double Sided Clocks — One (1)

02 Attic Stock w/o Installation
- a. 2x2 lay-in ceiling speakers — Five (5)
- b. 1x2 lay-in ceiling speakers — Five (5)
- c. Round Cut-in ceiling speakers with backboxes — Five (5)
- d. Recessed Exterior Horn Speakers — Two (2)
- e. Volume Control Switches — Two (2)
- f. Call Buttons — Five (5)
- g. Single Sided Clock — One (1)
- h. Double Sided Clocks — One (1)

03 Remote Controls: Contractor shall turnover all remote controls, with batteries installed, to Owner upon project completion.

04 Keys: Contractor shall turnover all keys, tagged and organized by type on individual key rings, to Owner upon project completion.

05 Reference drawing details for additional spare requirements.

H. DIVISION 28:

01 Refer to Division 28 sections for additional information.

2.4 TRAINING

A. All training sessions for specific systems equipment (Audio/Video Systems, Local Sound Systems, Campus Communications Systems, etc.) shall be recorded and the recordings be included in the closeout materials.

B. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans and closeout documentation.

C. DIVISION 26:

01 Refer to Division 26 sections for additional information.

D. NETWORK CABLING AND INFRASTRUCTURE

01 12 Hours (4 hours to general staff and 8 hours to maintenance personnel)

E. CAMPUS MULTIMEDIA SYSTEMS:

01 16 Hours (8 hours to general staff and 8 hours to maintenance personnel)

F. LOCAL SOUND SYSTEMS:

01 16 Hours (8 hours to general staff and 8 hours to maintenance personnel)

G. CAMPUS COMMUNICATIONS SYSTEM:

01 12 Hours (4 hours to general staff and 8 hours to maintenance personnel)

H. DIVISION 28:

01 Refer to Division 28 sections for additional information.

2.5 SCHEDULED WARRANTY ITEMS

A. After 10 months but no more than 11 months from Owner acceptance the contractor shall perform:

01 A warranty walk with the Owner, Owner's Representative, Architect, and Engineer and correct any identified items.

END OF SECTION 27 00 10

SECTION 27 10 05 - GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

D. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

E. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

F. Provide Shop Drawings per Section 27 00 00.

1.2 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 27 00 00 – General Communication Systems Requirements

C. Section 27 00 10 – Communications Systems Closeout Requirements

D. Section 27 05 28 – Pathways for Communications Systems

E. Section 27 10 00 – Communications Cabling General Requirements

F. Section 27 11 00 – Communications Equipment Room Fittings

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 40 00 – AV/Multimedia General Requirements

L. Section 27 41 00 – Campus Multimedia Systems (CMS)

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

1.3 DIVISION OF SCOPE

A. Division 26 electrical contractor shall provide and install Ground busbars and Bonding Backbone Conductor between rooms. E.C. shall also connect telecom ground system to main electrical ground system.

B. Division 27 Communications Contractors shall connect all racks, cabinets, armored cable, tray, ladder rack, and similar equipment provided under their sections to the local ground busbar.

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.5 REFERENCE STANDARDS AND CODES

A. IEEE C2-2007 - 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-B-2011 - 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

PART 2 - PRODUCTS

2.1 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.

2.2 GROUNDING AND BONDING CABLE

A. The grounding and bonding cable shall be stranded copper conductors. AWG size as specified in conductor sizing chart below and as specified on project drawings.

B. The grounding and bonding cables shall have a green jacket color and riser or plenum rated as required.

2.3 GROUNDING AND BONDING BUSBARS

A. Telecommunications Main Grounding Busbar (TMGB)

B. Telecommunications Grounding Busbar (TGB)

C. Horizontal Equipment Rack or Cabinet Busbar

D. Vertical Equipment Rack or Cabinet Busbar

2.4 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.

2.5 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. Lugs shall be 2-hole. Single hole lugs are not allowed.

F. Long barrel that will allow a minimum of two crimps with standard industry colors.

G. Each connector shall be filled with an oxide-inhibiting compound.

H. Crimped with a compression, tool and die system, according to manufacturer's recommendation.

2.6 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

3.1 GENERAL

A. Install products in accordance with manufacturer's instructions.

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.

3.2 RESISTANCE MEASUREMENT

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.

3.3 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:

01 Be connected to the TMGB & TGB.

02 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

03 The TBB conductors shall be installed and protected from physical and mechanical damage.

04 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.

3.4 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.

3.5 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.

3.6 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.

3.7 OPTICAL FIBER CONDUCTIVE CABLES

A. Conductive fiber-optic cables shall be bonded and grounded as specified in the NEC.

3.8 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.

3.9 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.

3.10 TESTING

A. Perform testing in accordance with test instrument manufacturer’s recommendations using the fall-of-potential method.

END OF SECTION 27 10 05

SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

D. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

E. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

F. Provide Shop Drawings per Section 27 00 00.

1.2 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 27 00 00 – General Communication Systems Requirements

C. Section 27 00 10 – Communications Systems Closeout Requirements

D. Section 27 05 26 – Grounding and Bonding for Communications Systems

E. Section 27 10 00 – Communications Cabling General Requirements

F. Section 27 11 00 – Communications Equipment Room Fittings

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 40 00 – AV/Multimedia General Requirements

L. Section 27 41 00 – Campus Multimedia Systems (CMS)

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

1.3 DIVISION OF SCOPE

A. Division 26 Electrical Contractor shall provide and install:

01 Raceway for communication systems devices

02 Cable tray, sleeves, pathways, etc. for routing of communication systems cabling through the building and between floors.

03 Cable tray, sleeves, and pathways for routing communications systems cabling into telecom rooms.

04 Grounding/bonding connections for all components installed by Division 26.

B. Division 27 Contractors shall provide and install:

01 Cable tray for routing of communication systems cabling within the telecom rooms.

02 Cable hooks for routing communications systems cabling within accessible ceilings.

03 Grounding/bonding connections for all components installed by Division 26.

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.5 REFERENCE STANDARDS AND CODES

A. ASTM B633 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

B. ASTM A510 – Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

C. NEMA VE 2-2000 – Cable Tray Installation Guidelines.

D. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes.

E. NEMA VE 1-1998 - Metallic Cable Tray Systems.

1.6 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Supplementary Conditions Specifications Sections.

01 Product Data: Submit manufacturer's data on supporting devices including catalog cuts, specifications, and installation instructions, for each type of support, anchor, sleeve and seal.

02 Where multiple products are shown on one cut sheet, circle product to be used.

03 Shop Drawings: Submit dimensioned drawings of fabricated products, indicating details of fabrication and materials.

04 Submit drawings of cable tray (ladder type and wire basket) and accessories including connector assemblies, clamp assemblies, brackets, splice plates, splice bars, waterfalls, grounding clamps and hold down plates showing accurately scaled components. Show layout, support and installation details.

05 Submit manufacturer's data on cable tray (ladder type and wire basket) support system including, but not limited to, types, materials, finishes, dimensions, colors and inside depths.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE PATHWAYS

A. CONDUITS AND SLEEVES:

01 Provided and installed by the Division 26 Electrical Contractor under section 260500 Common Work Results.

B. PRE-MANUFACTURED FIRE-RATED AND ACOUSTICAL PATHWAYS

01 Provided and installed by Division 26 under section 260500 Common Work Results.

2.2 LOW VOLTAGE CABLE TRAY

A. BUILDING PRIMARY PATHWAY CABLE TRAY:

01 Cable tray outside the telecom rooms provided and installed by Division 26 Electrical Contractor under section 260500 Common Work Results.

B. TELECOM ROOM CABLE TRAY

01 Cable tray within the telecom rooms provided and installed by the Division 27 Structured Cabling Contractor under section 271100 Communications Equipment Room Fittings.

2.3 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.

01 All Division 27 and Division 28 contractors shall route low voltage cabling separated by function in j-hooks.

02 Fiber shall be run in separate j-hooks from copper cabling.

03 Data cabling for security, access control, and CCTV systems shall be run separately from general data cabling.

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. Follow manufacturer’s recommendations for allowable fill capacity for each size of cable hook, minimum size 2”.

E. 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.

F. Cable hooks shall:

01 Have a flat bottom and provide a minimum of 1 5/8" cable bearing surface.

02 Have 90-degree radiused edges to prevent damage while installing cables.

03 Be designed so the mounting hardware is recessed to prevent cable damage.

04 Have a stainless steel cable latch retainer to provide containment of cables within the hook.

05 Have a retainer that shall be removable and reusable.

06 Be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, and floor posts, to meet job conditions.

G. Factory assembled multi-tiered cable hooks shall be used where required to provide separate cabling compartments, or where additional capacity is needed.

H. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653 G90. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.

I. Cable hooks for corrosive areas shall be Plenum or stainless steel, AISI type 304.

J. Cable hooks shall be:

01	Tomarco	Stiffy 200 Series
02	Erico	Caddy
03	Panduit	J-Pro
04	Cooper	B-Line Series
05	Other equivalent products or other manufacturers that meet these specifications and warranty.	

2.4 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 0000.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver cable tray (ladder type and wire basket) support systems and components carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.

B. Store cable tray (ladder type and wire basket) and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

C. Provide supporting devices that comply with manufacturer's standard materials. Install in accordance with published product information, and as required for a complete installation; and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is Contractor's option.

D. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NEC for installations of supporting devices.

E. Support all technology cables a minimum of every 4 foot with J-hooks, unless other supports are available.

F. Coordinate with the building structural system and electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

G. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.

H. Obtain approval from the Architect before drilling or cutting structural members.

I. Install surface-mounted cabinets and panels with minimum of four anchors.

3.2 MISCELLANEOUS SUPPORTS

A. Support miscellaneous technology components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panels, control enclosures, pull boxes, junction boxes and other devices.

3.3 FASTENING

A. Unless otherwise indicated, fasten technology items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, cabinets, panels, boxes and control components in accordance with the following:

01 Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

B. Holes cut into reinforced concrete beams or in concrete shall not cut reinforcing bars. If the Contractor cuts into any reinforcing bars, stop work and notify the Technology Consultant immediately. Fill all holes that are not used.

C. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration-and shock-resistant fasteners for attachments to concrete slabs.

3.4 RACEWAY AND CABLE TRAY INSTALLATION

A. Install cable tray (ladder type and wire basket) as indicated; in accordance with recognized industry practices (NEMA VE-2 2000), ensure that the cable tray equipment complies with requirements of the NEC, and all general installation practices.

B. Coordinate cable tray (ladder type and wire basket) with other electrical and mechanical work as necessary to properly interface installation of raceway with other work.

C. Provide sufficient space encompassing cable tray (ladder type and wire basket) to permit access for installing and maintaining cables.

D. For added support and stability, securely fasten cable tray (ladder type and wire basket) to top of racks and to walls in all MDF/IDF rooms at elevations shown on drawings.

E. In areas without suspended ceilings, install cable tray (ladder type and wire basket) raceways 6” below the lowest obstruction unless otherwise directed.

F. Install all raceways parallel to the wall or ceiling lines unless otherwise noted. Support basket cable raceways every 4’ minimum and at 6” from ends or boxes.

G. Ground the raceway per NEC Article 250, 392 and ANSI/TIA/EIA-607.

H. Route raceways in a manner to avoid steam, water, or other liquid piping.

I. Fish or blow through every run of conduit before plastering to guard against obstructions or omissions and plug ends carefully with tight fitting wood plugs or bush caps to avoid filling with plaster, dust, etc. and to avoid the possibility of condensation.

J. Leave nylon or steel fish wire in all raceways where permanent wiring is not being installed under this contract.

K. Install conduit making the total cross-sectional area of each raceway of sufficient size to permit ready installation or withdrawal of the cables required therein.

L. Route cable tray (ladder type and wire basket) a minimum of 5” clearance from fluorescent light fixtures, 12” clearance from electrically operated equipment and all wiring at 120 or more volts and 4 ft. from transformers or large motors.

M. All technology conduits are to be provided with nylon bushings to allow for cable pulling without damage.

N. For cable support, provide strain relief a minimum of every 10’ in vertical conduits runs. Provide the proposed method and products as a product submittal.

O. Division 26 to provide minimum 1-2” sleeve thru walls for routing data cabling into offices, huddle rooms, zoom rooms, labs & lab equipment/support spaces, etc. from hallways. Provide additional sleeves or increase sleeve size to maintain maximum 40% conduit fill.

3.5 TESTS

A. Test pull-out resistance of one of each type, size and anchorage material for the following fastener types:

01 Expansion anchors.

02 Toggle bolts.

03 Powder-driven threaded studs.

B. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain and submit the Structural Engineer’s signed approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and retest until satisfactory results are achieved.

C. Test cable tray (ladder type and wire basket) support systems to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance.

01 Manufacturer shall provide test reports witnessed by an independent testing laboratory of the “worst case” loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1.

END OF SECTION 27 05 28

SECTION 27 10 00 - COMMUNICATIONS CABLING GENERAL REQUIREMENTS;

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 SCOPE

A. Refer to Section 27 00 00 for additional project scope information. (Note to specifier: Add specific scope requirements by section on project by project basis.)

B. This section describes the products and execution requirements related to furnishing and installing Category 6 Cabling and Termination Components and related subsystems as part of a Structured Cabling System.

C. Backbone system comprising copper and fiber optic cabling and horizontal (station) cabling is covered under this document.

D. Others will provide the network electronics for the LAN within the Telecom Rooms (TRs). The contractor shall be be responsible for connecting the new cabling infrastructure to the LAN. This Contractor, however, shall supply the Category 6 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. The Division 26 Electrical Contractor shall install conduits and surface raceway for new technology outlet locations unless otherwise noted. Division 27 Structured Cabling Contractor shall coordinate on site project walk thru(s) with Electrical Contractor to coordinate details of installation and pathway requirements.

F. The Structured Cabling Contractor shall provide and install all sleeves through the wall penetrations as required whether or not 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).

H. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the TX Electrical Code, 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.

1.3 RELATED WORK

A. Section 27 00 00 – General Communication Systems Requirements

B. Section 27 00 10 – Communications Systems Closeout Requirements

C. Section 27 05 26 – Grounding and Bonding for Communications Systems

D. Section 27 05 28 – Pathways for Communications Systems

E. Section 27 10 00 – Communications Cabling General Requirements

F. Section 27 11 00 – Communications Equipment Room Fittings

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 40 00 – AV/Multimedia General Requirements

L. Section 27 41 00 – Campus Multimedia Systems (CMS)

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

O. Section 28 13 00 – Security and Access Control System

P. Section 28 16 00 – Video Surveillance System

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.5 REFERENCE STANDARDS AND CODES

A. 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.

B. ASTM B633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel

C. ASTM A653: Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process

D. ASTM A123: Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel

E. ASTM A510: Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

F. ANSI/TIA 569-C: Telecommunications Pathways and Spaces

G. ANSI/TIA 568-C.0, 1, 2, 3, 4: Commercial Building Telecommunications Standard

H. ANSI/TIA-598-C-2005 – Optical Fiber Cable Color Coding

I. ANSI/TIA 606-B: Administration Standard for Telecommunications Infrastructure

J. ANSI/TIA 942-A: Telecommunications Infrastructure Standard for Data Centers

K. ANSI/TIA 607-B: Generic Telecommunications Grounding (Earthing) and Bonding for Customer Premises

L. IEEE: National Electrical Safety Code® (NESC®) standards.ieee.org/about/nesc

1.6 QUALIFICATIONS

A. 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.

B. Materials and Equipment: Where materials or equipment are specified to conform, be constructed, or be tested to meet specific requirements, 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.

C. Installers

01 The Contractor shall have an RCDD (Registered Communication Distribution Designer) on staff assigned to manage this Project; documented proof shall accompany the proposal response.

02 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, or the Contractor shall contract with manufacturer for installation of all proposed components. Company Certifications shall accompany the proposal response.

03 The Contractor's technicians shall be certified and trained in the connectivity hardware that is being installed.

04 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.

1.7 PRE-CONSTRUCTION SUBMITTALS

A. Shop Drawings:

01 Equipment rack elevation details

02 Elevations of telecommunication room walls mounted equipment

03 Outlet faceplate details for all outlet configurations, sizes, and cable types

04 Overhead telecommunication room enlargements, provide dimensions of room and clearance for maintenance and operation

1.8 DELIVERY, STORAGE, AND HANDLING

A. Vendor 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. If the Contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner.

E. 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

2.1 ACCEPTABLE SOLUTIONS

A. Structured cabling systems shall be complete end to end system by the approved manufacturers, installed by a factory certified installer, with a full 25 year factory warranty.

01 Individual components listed by other manufacturers shall be acceptable for use where they do not nullify the factory certification or warranty.

B. Manufacturers:

01 **PANDUIT**

02 **COMMSCOPE**

03 No exceptions without prior approval before the bid.

2.2 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper and timely completion.

B. Verify cable lengths comply with published standards.

C. Notify Owner of installation that would exceed maximum lengths prior to installation of cable.

D. Contactor shall consult with Owner regarding alternative routing or location of cable.

E. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION REQUIREMENTS

A. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment shall include, but not be limited to,

sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge, and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices that may move or wear in a manner to pose a hazard to the cable shall not be used.

B. Service Loops: A surplus of cable, typically located at or near the point of termination to facilitate potential future changes. Cables shall have a minimum cable slack of 10ft (3m) at the telecommunication room(s) and 3.28ft (1m) at each telecommunications outlet in the suspended ceiling unless noted otherwise. Service loops shall be stored in an extended loop or in a figure- eight configuration, not in bundled loops.

C. Cable Support (TIA 569-C.9.7):

01 Non-continuous supports shall be located at intervals not to exceed 1.5 m (5 ft). Non- continuous supports shall be selected to accommodate the immediate and anticipated quantity, weight, and performance requirements of cables.

02 It is recommended not to make long runs exactly 5 ft apart due to “harmonics” issues per cable manufacturers

03 Non-continuous pathways do not need to be bonded together or grounded (see 2011 NEC 250.92.A.1

D. Maximum pulling tension (TIA 568-C.5.3.1):

01 The pulling tension for a 4-pair balanced twisted pair cable shall not exceed 110 N (25 lbf) during installation. For multipair cable (12-pair and above), manufacturer’s pulling tension guidelines shall be followed.

02 Sags between supports shall be a maximum of 300 mm (12 inches).

3.3 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.

3.4 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 test results and describe the conduct of the tests, 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. Backbone voice cables shall be free of shorts within the pairs and be verified for continuity, pair validity and polarity, and conductor position on the termination blocks (e.g., 110). Any mispositioned pairs shall be identified and corrected. The percentage of "bad" pairs shall not exceed 1% in any backbone (riser or tie) cable based on total pair count. All bad pairs shall be identified and documented.

I. The Consultant or Owner may request that a 10% random field re-test be conducted on the cable system to verify documented findings.

01 If requested, the Contractor shall test up to 10% of cable links at no cost to the Owner.

02 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.

3.5 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.

3.6 TRAINING

A. Reference 270010 Closeout Requirements.

B. Coordination and Personnel: Training shall be coordinated with Owner's schedule, and Contractor personnel who provide training are subject to Owner's approval.

3.7 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 270010 Closeout Requirements.

B. The contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion as

attic stock. No devices shall be used without documentation and written authorization from the Owner's representative.

C. Unused items shall be turned over to the owner within thirty (30) days of substantial completion of the project. Unused material is to be ordered separately when commissioning is scheduled in order to ensure the longest warranty period possible.

D. Contractor shall obtain a signed transmittal of equipment turned over to the owner at the end of the project. The signed transmittal shall be included in the contractor's closeout documents.

3.8 WARRANTY

A. Reference 270010 Closeout Requirements.

B. The Contractor shall provide to the Owner a manufacturer's warranty certificate for all materials, equipment, etc. Upon successful completion of the installation and subsequent inspection, the Owner shall receive a 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 the entire warranty period. The warranty shall apply to all passive structure 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, for the entire warranty 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.

3.9 CLOSEOUT DOCUMENTATION

A. Reference 270010 Closeout Requirements.

END OF SECTION 27 10 00

SECTION 27 11 00 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 SCOPE

A. Refer to Section 27 00 00 for additional project scope information. (Note to specifier: Add specific scope requirements by section on project by project basis.)

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:

01 Equipment room cable management system and equipment racks

02 Horizontal and backbone cable terminating equipment

03 Telecommunications grounds and related components

1.3 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 26 05 26 – Grounding and Bonding

C. Section 27 00 00 – General Communication Systems Requirements

D. Section 27 00 10 – Communications Systems Closeout Requirements

E. Section 27 05 26 – Grounding and Bonding for Communications Systems

F. Section 27 05 28 – Pathways for Communications Systems

G. Section 27 10 00 – Communications Cabling General Requirements

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 – Campus Multimedia Systems (CMS)

N. Section 27 41 50 – Local Sound Systems

O. Section 27 51 00 – Campus Communications Systems

P. Section 28 13 00 – Security and Access Control System

Q. Section 28 16 00 – Video Surveillance Systems

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

PART 2 - PRODUCTS

2.1 NETWORK EQUIPMENT / SWITCHES

A. Include installation of OFCI data switches in the racks and all associated patch cords for a complete and operable system.

B. The contractor shall anticipate one (1) 48-port 1-RU network switch for each 48 cables in the MDF/IDF, plus one additional switch for additional port capacity.

01 OFCI Switches Cisco 3850-48F-L

02 The network switches specified here are the Owner's standard equipment. All network switches shall be provided by the Owner and installed by the contractor under this project.

C. Network equipment configuration and integration shall be performed by the Owner's technology department.

2.2 WIRELESS ACCESS POINTS

A. Include installation of OFCI wireless access points (WAPs) shown on the drawings and all associated cords, plates, mounts, and protective equipment for a complete and operable system.

B. The contractor shall anticipate one (1) WAP and one (1) data drop for each location shown on the drawings.

01 OFCI Interior WAPs Cisco 3802i

02 OFCI Exterior WAPs Cisco 1562I

03 Where the drawings indicate a wall mounted AP with protective guard the contractor shall provide and install the specified protective enclosure.

a. Oberon 1015-C Plastic Wi-Fi Access Point Lock Box with Translucent Door, quantity one (1) per WAP.

C. Network configuration and integration shall be performed by the Owner's technology department.

2.3 NETWORK UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Install OFCI uninterruptible power supply (UPS) in the racks and all associated cords for a complete and operable system including connection of OFOI equipment.

B. The contractor shall anticipate one (1) 2RU UPS for each rack in the MDF/IDF.

01 OFCI UPS APC 1500 RM2U

C. Configuration and integration of the OFCI UPS shall be performed by the Owner's technology department.

2.4 ELEVATOR CELLULAR DIALER

A. Provide and install CFCI cellular dialer for elevator cab phone system. Coordinate with elevator manufacturer for connection locations and requirements.

B. Cellular Dialer Equipment Specifications

01 Two (2) RJ-11 ports

02 DTMF 2'nd dial out

03 Supports 1 SIM Card

04 SIM card support

05 NI-MH battery (3.6V,1000mAh) with 48hr stand-by / 4hr talk time

06 TNC Connector with GMS antenna

07 Power input: 12V,0.5A

08 Connection mode: RJ-11 phone socket

09 Power connector: US or European

10 P15 FCC compliance – UL Rated

11 Air Interface – GSM 4G LTE

12 RF Frequency – 800MHz/1900Mhz

13 Operating Condition – : -10ºC ~ 50ºC

14 ASME A17.1 Compliance

C. The contractor shall anticipate one (1) wall mounted cellular dialer for each elevator.

D. Connection, configuration, and integration of the cellular dialer shall be performed by the Structured Cabling contractor in collaboration with the Owner and elevator contractor.

E. Manufacturers:

01 **MyLinkLine** **Cellular Elevator Phone Line**

02 Other equivalent products that meet these specifications and warranty with prior written approval.

2.5 CATEGORY 6 PATCH PANELS

A. Cables shall be terminated at the telecommunication rooms on high-density modular integrated patch panels incorporating color coded modular Category 6 jack inserts (non-keyed 8-pin), meeting the specifications for the telecommunications outlet.

B. Patch panel configuration shall be 24 or 48 modular ports.

C. The patch panel shall exceed ANSI/TIA/EIA 568-C.2-1 Category 6 component compliance standard.

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 support bar to secure the horizontal cables behind the patch panels.

F. The patch panel shall have color-coded designation strips to identify cable count.

G. No more than six (6) copper patch panels shall be placed in a single rack.

H. Manufacturers:

01 Panduit

a.	24 port, 1U	CPP24FMWBLY
b.	48 port, 2U	CPP48FMWBLY

02 Commscope:

a.	24 port, 1U	CPP-UDDM-M-1U-24
b.	48 port, 2U	CPP-UDDM-M-2U-48

03 Other equivalent products that meet these specifications and warranty with prior written approval.

2.6 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 SC 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.

01 Couplings shall have ultra physical contact (UPC) fiber connectors.

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:

01 Fiber Patch Panel

a. MDF (4RU)

1)	Corning	PCH-04U
2)	Panduit	FRME-4
3)	Commscope	EPX-2U-PNL-ENC-FX

b. IDF (2RU)

1)	Corning	PCH-02U
2)	Panduit	FRME-2
3)	Commscope	EPX-4U-PNL-ENC-FX

c. Wall Mounted Cabinet (1RU)

1)	Corning	PCH-01U
2)	Panduit	FRME-1
3)	Commscope	EPX-1U-PNL-ENC-FX

02 Other equivalent products that meet these specifications and warranty with prior written approval.

L. Fiber adapter panels shall be:

01 SC Duplex Adapter Panels

a. OS2 Singlemode

1)	Corning	CH-CP12-59
2)	Panduit	FAP6WBUDSCZ
3)	Commscope	PNL-BK-012-SFA-SC02

02 Other equivalent products that meet these specifications and warranty with prior written approval.

2.7 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.

01 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 Owner.

b. Rack shall be 84" in height and shall be self-supporting.

c. Channel uprights shall be spaced to accommodate industry standard 19" mounting and have pass-through holes with smooth edges to protect cables.

d. Rack shall be constructed of aluminum.

e. 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.

f. Rack shall be supplied with at least 24 spare screws.

g. Rack shall be supplied with a ground bar and #6 AWG ground lug.

h. Manufacturers:

1)	Chatsworth	55053-703
2)	Panduit	R2P
3)	Commscope	760082479 RK3-45A
4)	Other equivalent products that meet these specifications and warranty with prior written approval.	

02 4-Post Equipment Racks

a. The Contractor shall provide and install 4-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 Owner.

b. Rack shall be 84" in height and shall be self-supporting.

c. Channel uprights shall be spaced to accommodate industry standard 19" mounting and have pass-through holes with smooth edges to protect cables.

d. Rack shall be constructed of steel.

e. 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.

f. Rack shall be supplied with at least 24 spare screws.

g. Rack shall be supplied with a ground bar and #6 AWG ground lug.

h. Manufacturers:

1)	Chatsworth	15217-703
2)	Chatsworth	50120-703
3)	Panduit	R4P
4)	Commscope	760082529 RK4P45-29A
5)	Other equivalent products that meet these specifications and warranty with prior written approval.	

03 Wall Mounted Data Cabinet

a. The Contractor shall provide and install wall mounted equipment racks to house cable termination components (e.g., copper data and fiber optic) and network electronics (OFCI) as shown on the drawings. Prior to installation, the Contractor shall coordinate exact placement with Owner and building elements.

b. Cabinet shall be minimum 19U in height, 30” deep and shall be self-supporting, black.

c. Cabinet shall have a minimum weight capacity for 200lbs of equipment.

d. Channel uprights shall be spaced to accommodate industry standard 19" mounting and have pass-through holes with smooth edges to protect cables.

e. Cabinet shall be constructed of 16-gauge CRS throughout.

f. Cabinet shall have a solid front door, and vented swing-out cabinet body with front door and rear panel locks.

g. Provide optional low-decibel dual-fan and filter kit.

h. Cabinet 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.

i. Cabinet shall be supplied with at least 24 spare screws and five (5) sets of keys.

j. Cabinet shall be supplied with a ground bar and #6 AWG ground lug.

k. Manufacturers:

1) Chatsworth Cube-IT w/ Low-Decibel Fan Kit

2) Other equivalent products that meet these specifications and warranty with prior written approval.

B. Vertical Cable Management

01 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.

1) Provide vertical cable management on all rack posts including back posts for a 4-post rack.

2) Vertical cable management at the end of rack rows shall be 6”.

3) Vertical cable management between racks shall be 10”

02 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.

03 Vertical cable management system shall feature the following:

a. Open cabling section on the rear that provides easy access and routes cable bundles feeding into the back of patch panels and 1 RMU cable guide on the front designed for fanning and managing patch cords.

b. Edge-protected pass-through ports designed for easy routing of cable from front channel to back.

c. Vertical slots along the center separator to allow securing cable bundles neatly with management straps.

d. Door/cover (front only) that is easily opened from the right or left and still easily removed to allow for quick moves, adds, and changes.

e. Movable wire retainers to retain the cables during cover removal.

04 Manufacturers

a.	Chatsworth	Evolution G3 Series 3557x-x03
b.	Panduit	NRVxx.
c.	Commscope	VCM-DS-xx

d. Other equivalent products that meet these specifications and warranty with prior written approval.

05 Horizontal Cable Management

a. 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.

b. 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.

c. Manufacturers:

1)	Chatsworth	30130-719
2)	Panduit	NCMH2
3)	Commscope	760072959 HTK-19-SS-2U

a. Other equivalent products that meet these specifications and warranty with prior written approval.

2.8 ETHERNET WITH POWER OVER ETHERNET (POE) UTP EXTENDER

A. The Contractor shall provide PoE UTP extenders for out-of-distance devices.

01 Provide rack mounted shelf for loose items.

02 Provide multi-port rack mounted device where four (4) or more extenders are required within a single telecom room.

03 Locate rack mounted PoE extenders in the first rack beneath the fiber patch panel(s).

B. Shall support IEEE 802.3af (PoE) and IEEE 802.3at (PoE+) and PoE++ up to 74W on input and output.

C. Extends cable range up to 3,000ft over UTP Cables.

D. No configuration required.

E. No power supply required.

F. Maintains full-rate network throughput.

G. Acceptable Manufacturers:

01 Basis of Design: Vigitron

a. Vigitron Midspan Vi2300A (Interior Mounted Only)

b. Vigitron Midspan Vi2301A (Interior Mounted Only)

c. Vigitron Midspan Vi2300W

d. Vigitron Vi2308A (8-port Rack Mounted)

e. Vigitron Vi2316A (16-port Rack Mounted)

02 Other equivalent products that meet these specifications and warranty with prior written approval.

2.9 POWER STRIPS

A. Provide the following power strips at each location:

01 MDF

a. One (1) 20A, 120V power strip per rack.

02 IDF

a. One (1) 20A, 120V power strip per rack.

B. Vertical Power Strip

01 20A, 120V Power Strips

a. 7ft Equipment Racks

1) Provide one (1) per rack.

2) Metered rack power distribution units.

3) 5-20P input connection, 1.9Kw, 100-120V

4) Twenty (24) 5-20R output connections

5) Basis of Design:

i.	APC	AP8830
ii.	Chatsworth	12848-756
iii.	Panduit	Q1N1B1C0A24AKA0

02 Acceptable Manufacturers:

a. Chatsworth

b. APC

c. Panduit

d. Tripp Lite

e. Eaton

f. Cyber Power

g. Other equivalent products that meet these specifications and warranty with prior written approval.

2.10 TELECOMMUNICATION GROUND

A. The Telecommunications Contractor is responsible for providing an appropriate ground for all racks, trays, and telecommunications equipment installed by this Contractor.

2.11 TELECOM ROOM CABLE TRAY

A. Provided and installed by Division 27 under this specification.

B. Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

C. The Contractor shall provide all necessary labor, supervision, materials, equipment, tests, and services to install a complete basket tray system within the building as shown on the Drawings.

D. Provide cable tray of types and sizes indicated; with connector assemblies, clamp assemblies, connector plates, splice plates and splice bars. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

E. Material and finish specifications for each metal cable tray type are as follows:

01 Straight sections shall be made from steel meeting the minimum mechanical properties of ASTM A510 and shall be coated after the wire basket runway has been fabricated in accordance with ASTM A123 (CSA Type 1). All hot-dip galvanized sections must be returned to the point of manufacture after coating for inspection and removal of all icicles and excess zinc. Failure to do so may result in damage to cables and/or injury to installers.

a. Cable tray installed in telecom rooms shall have a flat **BLACK** finish.

02 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.

F. WIRE BASKET TRAY

01 Within each Telecommunications Room, the Contractor shall provide and install wire basket tray to support cable bundles from the corridor to equipment racks and additionally as shown on the Project Drawings.

02 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.

03 Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

04 All straight section longitudinal wires shall be straight (with no bends).

05 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 for safety of cables and installers.

06 All fittings shall be field formed as needed.

07 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.

08 Wire Basket Tray shall be grounded to the local Telecommunications Room ground bus bar.

09 Cable Drop Out/Waterfall

a. Where cables bundles transition from tray and drop to the rack, cabinets or ladder rack, 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.

10 T-sections of tray shall be made using T-section fittings.

11 Straight section splices shall be made using splice plates.

12 Provide size as indicated on the drawings.

13 Accessories (connectors, splice plates…) shall match tray finish.

14 All 90 degrees turns shall use factory premade radius 90-degree tee bend kits. No field bending will be approved.

15 Wire basket cable tray shall conform to the following nominal criteria:

a. Straight sections shall be furnished in standard lengths.

b. Wire basket shall have a 4-inch usable loading depth by the width identified on the drawings.

c. All fittings shall be field formed as needed.

d. The installation and all fittings of all raceways shall allow Category 6 cable and fiber optic cable to be pulled in and through in such a manner as to not exceed the pulling tension or minimum bending radius.

e. All turns and tees shall be made with radius 90s using premanufactured kits designed for that purpose to maintain cable bend radii.

f. Minimum radius shall be 5 inches.

g. No field bending will be approved.

h. All splicing assemblies shall be the bolted type using flange locknuts.

i. Cable tray supports shall be center support hangers, trapeze hangers or wall brackets.

1) All cable tray shall be secured to the walls to prevent swaying.

2) All center support and trapeze hangers shall be supported by 3/8 inch diameter rods.

3) Wire basket runway shall be supported by center support trapeze hangers when spanning the room.

j. Special accessories shall be furnished as required to protect, support and install all cable tray support systems.

16 Basis of Design Manufacturer: Legrand Cablofil

a. Wire Basket Tray

1) CF54/100 (EZ) 2” D x 4” W Wire Basket Tray

2) F105/200 BC (EZ) 4” D x 8” W Wire Basket Tray

3) CF105/300 BC (EZ) 4” D x 12” W Wire Basket Tray

4) CF105/600 BC (EZ) 4” D x 24” W Wire Basket Tray

5) Refer to the drawings for cable tray sizes at each location.

b.	5” Radius Tee 90° Kit	RADT 90 KIT
c.	12” Radius Tee 90° Kit	RADT 90 12 KIT
d.	Elevation Change Hinge	EAC KIT
e.	Universal Bracket	FASUCB
f.	Universal Wall Bracket	CRP
g.	Vertical Bracket	FV

	h.	Trapeze Support	FAS P
	i.	Center Hanger	FAS PCH
	j.	Wall/Floor Termination Kit	HB 2 KIT
	k.	Splice Kit	SWK
	l.	Grounding Lug Kit	GNDCL
	m.	Plastic Insert with Sides	INSERTPPxx/xx
	n.	Blind End	BE

17 Acceptable Manufacturers:

a. BASOR

b. Cooper B-Line

c. Legrand Cablofil

d. Pentair Hoffman

e. Other equivalent products that meet these specifications and warranty with prior written approval.

2.12 LADDER RACK

A. Within each Telecommunications Room, the Contractor shall provide and install ladder rack to support cable bundles from the corridor to equipment racks and additionally 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. Within each Telecommunications Room with cabling routed vertically along the wall the Contractor shall provide and install vertical ladder rack to support the telecommunications cabling.

D. Provide runway to rack mounting kit when securing ladder rack to equipment racks.

E. The Contractor shall provide all necessary labor, supervision, materials, equipment, tests, and services to install a complete ladder rack system in the telecommunications room as shown on the Drawings.

F. Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions.

G. 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.

H. Cable Drop Out/Waterfall

01 Where cables bundles transition between trays of different elevation and from tray into the racks/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.

I. Ladder rack shall be a minimum 4” in width or as indicated on the Contract Documents.

J. Accessories (connectors, splice plates…) shall be painted to match tray finish.

K. All 90 degrees turns shall use factory premade radius 90-degree tee bend kits. No field bending will be approved

L. Provide ladder tray within telecom rooms

M. Provide ladder tray for transitions in elevation for cable runs. Some examples where ladder tray shall be required:

01 Between cable tray of different elevations.

02 From cable tray to sleeves in walls.

03 From conduit stub ups to cable tray.

N. Manufacturers:

01 Basis of Design Manufacturer: Chatsworth

a. Ladder Cable Tray

1) 10250-Xxx

b.	Channel Rack-To-Runway Kit	10595-Xxx
c.	3” Channel Rack-To-Runway Kit	12730-Xxx
d.	Cable Runway Elevation Kit	10506-Xxx
e.	Wall Angle Support Kit	11421-Xxx
f.	Wall Triangular Support Bracket (Steel)	11746-Xxx
g.	Ceiling Support Kit	11310-Xxx
h.	Vertical Wall Brackets	10608-Xxx
i.	Foot Kit Cable Runway	11309-Xxx

j. Waterfall Radius Dropouts

1)	Runway Radius Drop Stringer	12100-Xxx
2)	Adjustable Runway Radius Drop	12101-Xxx
3)	Tool-less Stringer Radius Drop	14305-Xxx
4)	Tool-less Cross Member Radius Drop	14304-Xxx

02 Acceptable Manufacturers:

a. Cooper B-Line

b. Legrand Cablofil

c. Pentair Hoffman

d. Other equivalent products that meet these specifications and warranty with prior written approval.

2.13 LOW VOLTAGE PATHWAYS

A. Each equipment room shall be provided with pre-installed firestop sleeves/pathways for installed and future cabling by Division 26. Coordinate with the installing contractor for locating the following pathways per telecom room.

01 MDF

a. Provide minimum of four (4) 4” pathways to adjoining corridor space.

b. For multi-story buildings provide a minimum of four (4) 4” pathways each to the floors above and below.

c. Provide additional pathways as indicated on the drawings.

02 IDF

a. Provide minimum of four (4) 4” pathways to adjoining corridor space.

b. For multi-story buildings provide a minimum of two (2) 4” pathways each to the floors above and below.

c. Provide additional pathways as indicated on the drawings.

B. Conduit/raceway

01 Provided by Division 26 Electrical Contractor.

02 All exposed telecommunications cabling shall be installed in conduit except within telecom rooms.

2.14 PLYWOOD

A. The Contractor shall provide plywood installed on walls within each telecom room with telecom equipment, cables, or ladder racks and other locations as noted.

B. Provide void-free, interior grade, fire rated A-C grade plywood, 3/4” by 48” by 96”, or as indicated.

C. When plywood is required to be painted, the paint shall be UL 723 rated white or gray fire retardant. The plywood’s rating stamp shall be exposed (not painted over) on each sheet. Plywood shall have fire calk around all edges. Provide label including paint manufacturer, date painted, UL listing and name of Installer

D. Plywood shall be mounted vertically starting at 22” AFF to 118” AFF and anchored to wall. Anchor to all studs located behind the plywood when mounting to a stud framed wall.

PART 3 - EXECUTION

3.1 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

3.2 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 ground (TGB) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket).

3.3 WIRE BASKET TRAY AND LADDER RACK RUNWAY

A. 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.

B. Coordinate installation of runway with other electrical work as necessary to properly interface installation of wire basket runway with other work.

C. Provide sufficient space encompassing runways to permit access for installing and maintaining cables.

D. Test runways to ensure electrical continuity of bonding and grounding connections and to demonstrate compliance with specified maximum grounding resistance.

3.4 TESTING

A. Refer to Section 27 00 10 for additional requirements.

3.5 TRAINING

A. Refer to Section 27 00 10 for additional requirements.

3.6 WARRANTY

A. Refer to Section 27 00 10 for additional requirements.

END OF SECTION 27 11 00

SECTION 27 13 00 COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 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:

01 OS2 Single-Mode Fiber Optic Cable with interlocking armor

02 Multi-Pair Copper Voice Backbone Cable

1.3 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 27 00 00 – General Communication Systems Requirements

C. Section 27 00 10 – Communications Systems Closeout Requirements

D. Section 27 05 26 – Grounding and Bonding for Communications Systems

E. Section 27 05 28 – Pathways for Communications Systems

F. Section 27 10 00 – Communications Cabling General Requirements

G. Section 27 11 00 – Communications Equipment Room Fittings

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

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.5 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 USB Drive. This USB drive 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:

01 The identification of the link in accordance with the naming convention defined in the overall system documentation.

02 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).

03 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:

01 The identification of the customer site as specified by the end user.

02 The overall Pass/Fail evaluation of the link-under-test.

03 The name of the standard selected to execute the stored test results.

04 The cable type and the value of the ‘index of refraction’ used for length calculations.

05 The date and time the test results were saved in the memory of the tester.

06 The brand name, model, and serial number of the tester.

07 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:

01 The identification of the link/fiber in accordance with the naming convention defined in the overall system documentation.

02 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

2.1 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.

2.2 BACKBONE VOICE CABLING

A. The voice backbone cable shall link the MDF and IDF/Telecommunications Rooms serving the building and the telephone utility demarc. The cables shall be CMP rated.

B. Voice backbone cables shall be Category 3 performance to each IDF/TR. Cables shall terminate on 24-port RJ-45 patch panels (pins 5/4) in each room.

C. Contractor shall also provide and install a backbone cable from the demarcation point wall field to MDF rack.

D. Voice backbone cable shall incorporate 24 AWG solid annealed copper conductors insulated with a polyvinyl chloride skin over expanded polyethylene. Conductors shall be twisted to form pairs and fully color-coded.

E. The voice backbone cable shall be sized as detailed on the Drawings and specifications.

F. Conductors shall be identified by the insulation color of each conductor. The color code shall follow the industry standard composed of ten (10) distinctive colors to identify 25 pairs in accordance with ICEA publication S-80-576-1988. Marking of each mate of the primary conductor in a pair with the color of that primary conductor is optional.

G. The voice backbone cable shall meet or exceed the EIA/TIA Category 3 performance requirements.

H. When cables of larger than 25 pairs are required, the core shall be assembled into 25-pair subunits, each color-coded in accordance with ICEA publication S-80-576-1988. Cables with over 600 pairs shall have 25-pair binder groups combined into super units. These super units shall be wrapped with a solid color thread that follows the primary color scheme of white, red, black, yellow, and violet. Binder color code integrity shall be maintained wherever cables are spliced.

I. All cables and equipment shall be furnished, installed, wired, and tested by the Contractor.

J. Manufacturers:

01 25-pair CAT3 Plenum Rated

a. Superior Essex CMP 18-475-46

b. General Cable

c. Panduit

d. Commscope

02 Other equivalent products that meet these specifications and warranty with prior written approval.

2.3 TIGHT-BUFFERED OPTICAL FIBER CABLES FOR INDOOR DISTRIBUTION APPLICATIONS

A. General Considerations

01 The cable shall meet the requirements of the National Electrical Code (NEC) Section 770.

02 For plenum applications, the cable shall meet applicable flame tests: ANSI/UL 910 (NFPA 262-1994).

03 Cables shall be listed OFNP (OFCP).

04 Finished cables shall conform to the applicable performance requirements of Tables 8-6 and 8-7 of the Insulated Cable Consultants Association, Inc. (ICEA) *Standard for Fiber Optic Premises Distribution Cable* (ICEA S-83-596).

B. Cable Construction

01 The coated fiber shall have a layer of Teflon placed between the acrylate coating of the optical fiber and the thermoplastic buffer. The diameter of the thermoplastic buffer coating shall be 900 ±50µm. The fiber coating and buffer shall be removable with commercially available stripping tools in a single pass for connectorization or splicing.

02 Cables with 2 to 24 fibers layered aramid yarns shall serve as the tensile strength member of the cable.

03 A ripcord shall be applied between the aramid yarns and the outer jacket to facilitate jacket removal.

04 The outer jacket shall be extruded over the aramid yarns for physical and environmental protection. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.

05 The fibers shall be stranded around a dielectric central member.

06 For cables containing 12-24 fibers, the fibers shall be arranged in two layers.

07 The central member shall be over coated with a thermoplastic, when required, to achieve dimensional sizing to accommodate and support the 900 µm buffered fibers.

08 Cables with 24 to 60 fibers shall have unitized riser and plenum constructions.

09 The buffered fibers shall be grouped in six-fiber subunits.

10 The fibers shall be stranded around a dielectric central member in the subunit.

11 Layered aramid yarns shall serve as the tensile strength member of the subunit.

12 A ripcord may be applied between the aramid yarns and the subunit jacket to facilitate jacket removal.

13 The subunit jacket shall be extruded over the aramid yarns for physical and

environmental protection. The jacket shall be continuous and free from pinholes, splits, blisters, or other imperfections .The jacket shall have a consistent, uniform thickness. The jacket shall be smooth, as is consistent with the best commercial practice.

14 The subunits shall be stranded around a dielectric central member. A ripcord shall be inserted beneath the outer jacket to facilitate jacket removal. The outer jacket shall be extruded around the subunits. The strength members shall be of a high modulus aramid yarn. The aramid yarns shall be helically stranded around the buffered fibers. Non-toxic, non-irritant talc shall be applied to the yarns to allow them to be easily separated from the fibers and the subunit jacket.

C. Outer Cable Jacket

01 The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand stresses. The nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, and environmental test requirements of this document over the life of the cable.

02 The indoor distribution cable specified herein shall have an interlocking armor made of steel or aluminum. The interlocking armor for plenum cables shall have a PVC jacket.

03 The color of the armor jacket shall match the jacket color of the optical fiber cable located inside of the armor. The armor for these cables shall be comparable to liquid tight flexible metal conduit if jacketed, or flexible metal conduit.

D. Fiber Identification

01 The individual fibers shall be color-coded for identification. The optical fiber color- coding shall be in accordance with ANSITIA/EIA-598-B “Optical Fiber Cable Color Coding.” The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color-coded buffered fibers shall not adhere to one another.

02 When buffered fibers are grouped into individual subunits, each subunit jacket shall be numbered for identification, with the exception of filler subunits where used. The number shall be repeated at regular intervals. The subunit jacket color shall be yellow for subunits containing single mode fibers and white for filler subunits.

03 The outer jacket for all dielectric cable shall be marked with the manufacturer name or UL file number, date of manufacture, fiber type, flame rating, listing symbol, and sequential length markings every two feet. The marking shall be in contrasting color to the cable jacket. The cable jacket color shall be yellow for cables containing single mode fibers.

04 Cables with a PVC jacket over interlocking armor shall be marked with the manufacturer name, date of manufacture, fiber type, flame rating, listing symbol, and sequential length markings every two feet. The marking shall be in contrasting color to the cable jacket. The cable jacket color shall match the color of the core optical fiber cable.

E. Cable Specifications

01 Temperature Range

a. Non-Plenum Applications: The storage temperature range for the cable on the original shipping reel shall be -40 to +70ºC. The installation/operating temperature range for riser cables shall be -20 to +70 ºC. Testing shall be in accordance with FOTP-3.

b. Plenum Applications: The storage temperature range for the cable on the original shipping reel shall be -40 to +70ºC.The installation/operating temperature range for plenum cables shall be 0 to +70ºC.Testing shall be in accordance with FOTP-3.

02 Compressive Load Resistance

a. When tested in accordance with FOTP-41, Compressive Loading Resistance of Fiber Optic Cables, the cable shall withstand a minimum compressive load of 89 N/cm (50 lbf/in) applied uniformly over the length of the compression plate. While under compressive load, the fiber shall not experience an attenuation change greater than 0.4 dB at 1550 nm (single mode). After the compressive load is removed, the fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single mode).

03 Cyclic Flexing

a. When tested in accordance with FOTP-104, Fiber Optic Cable Cyclic Flexing Test, the cable shall withstand 25 mechanical flexing cycles at a rate of 30 ± 1 cycle per minute. The fiber shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single mode).

04 High and Low Temperature Bend

a. When tested in accordance with FOTP-37, Fiber Optic Cable Bend Test, Low and High Temperature, the cable shall withstand four full turns around a mandrel at test temperatures of 0 ºC and +50 ºC. The fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single mode).

05 Impact Resistance

a. When tested in accordance with FOTP-25, Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies, the cable shall withstand a minimum of 20 impact cycles for riser cables and 10 impact cycles for plenum cables. The fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (single mode).

06 Temperature Cycling

a. When tested in accordance with FOTP-3, Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components, the change in attenuation at extreme operational temperatures (0 to +50 ºC) shall not exceed 0.3 dB/km at 1550 nm (single mode). The change in attenuation is measured with respect to the baseline values measured at room temperature before temperature cycling.

07 Twist-Bend

a. When tested in accordance with FOTP-91, Fiber Optic Cable Twist-Bend Test, a length of cable no greater than 2 meters shall withstand 10 cycles of mechanical twisting and bending around a mandrel 20 times the cable outer diameter. The fibers shall not experience an attenuation change greater than 0.2 dB at 1550 nm (singlemode).

F. Single Mode (OS2 9/125 µm)

01 The single mode fiber utilized in the optical fiber cable shall meet EIA/TIA-

492CAAB 2005, Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak (OS2 type). Cable shall have the following specifications:

a. Core Diameter: 8.2 ± 3 µm

b. Core Non-Circularity: ≤5%

c. Cladding Diameter: 125± 0.7 µm

d. Cladding Non-Circularity: <1.0%

e. Core-to-Cladding Concentricity: ≤ 12 µm

f. Coating Diameter: 245 ± 10 µm

g. Refractive Index Profile: Graded index

h. Numerical Aperture: 0.275 ± 0.015

i. Maximum Attenuation: Less than 0.5 dB/km at 1310 nm and 0.5 dB/km at 1550 nm.

02 IEEE 802.3ae Performance: The fiber shall support laser-based 10 Gigabit Ethernet Long Reach (10GbLR) operation for up to 10,000 meters and 10 Gigabit Ethernet Extended Reach (10GbER) operation for up to 40,000 meters.

03 Attenuation at the Water Peak: The attenuation coefficient at 1380 nm shall not exceed the attenuation coefficient at 1300 nm by more than 1 dB/km.

04 Macrobend Attenuation: The attenuation due to 100 turns of fiber around a 50-± 2 mm diameter mandrel shall not exceed 0.05 dB at 1310 nm or 1550 nm.

G. Approved Manufacturers:

01 Singlemode 9/125 µm (OS2):

a. Indoor, Plenum Rated:

1)	Corning	xxxE88-33131-A3
2)	Panduit	FSPP9xxY
3)	Commscope	P-xxx-DZ-8W-FSUYL

b. Indoor/Outdoor, Plenum Rated:

1)	Corning	xxxE8P-31131-A3
2)	Panduit	FSLP9xx
3)	Commscope	P-xxx-OZ-8W-FSUBK

02 Other equivalent products that meet these specifications and warranty with prior written approval.

2.4 FIBER OPTIC CONNECTOR

A. The optical connector shall be LC-type.

B. The connector ferrule shall be ceramic or glass-in-ceramic. The optical fiber within the connector ferrule shall be secured with an adhesive.

C. 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.

D. The connector shall meet the following performance criteria:

01 Cable Retention (FOTP-6) 0.2 dB

02 Durability (FOTP-21) 0.2 dB

03 Impact (FOTP-2) 0.2 dB

04 Thermal Shock (FOTP-3) 0.2 dB

05 Humidity (FOTP-5) 0.2 dB

E. Approved Manufacturers:

01 Connectors shall be by the same manufacturer as the installed fiber and be a field terminated connector.

PART 3 - EXECUTION

3.1 TESTING

A. Refer to Section 27 00 00 for additional requirements. (Need to add specific requirements for this section.)

B. Field Test Requirements for Fiber Optic Cabling System

01 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 manufacturer's on reel attenuation test results at 1310 nm and 1550 nm for Single Mode for each optical fiber of each reel prior to shipment from the manufacturer.

02 Factory data shall be provided upon request, showing on-the-reel bandwidth performance results as tested at the factory.

03 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.

04 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.

05 100% 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.

06 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

07 Field test instruments for singlemode fiber cabling shall meet the requirements of ANSI/EIA/TIA-526-7.

08 The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.

09 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.

10 The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests.

11 Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.

12 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.

13 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

01 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) The values for the Attenuation_Coefficient are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation_Coefficient (dB/km)
Single Mode OS2	1310	0.4
	1550	0.4

c. Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB) Maximum allowable mated connectors_loss = 0.50 dB

d. Splice_Attn (dB) = number of splices (S) * splice_loss (dB)

e. Maximum allowable splice_loss = 0.1 dB (when tested bidirectionally)

02 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.

03 Test equipment that measures the link length and automatically calculates the link loss based on the above formulas is preferred.

04 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.

05 The backbone link shall be tested in two directions at both operating wavelengths to account for attenuation deltas associated with wavelength.

06 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.

3.2 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. Exact cable termination locations shall be field verified with Owner.

C. Conductive fiber-optic cables shall be bonded and grounded as specified in the NEC.

END OF SECTION

SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 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 MDF/IDF telecommunications rooms (TR). Horizontal cabling is often referred to as “station cabling”.

C. The horizontal cabling system will consist of the following:

01 Unshielded Twisted Pair (UTP) Cable

02 Outlet Termination Modules (jacks)

03 Outlet Termination Plates

04 Horizontal Fiber Optic/Copper Composite Cabling

05 Above Ceiling Cable Support Systems

06 In-Line Cabling Surge Protection Devices

07 Horizontal Cable Testing Requirements

08 Cable Pathway/Sleeve Requirements

1.3 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 27 00 00 – General Communication Systems Requirements

C. Section 27 00 10 – Communications Systems Closeout Requirements

D. Section 27 05 26 – Grounding and Bonding for Communications Systems

E. Section 27 05 28 – Pathways for Communications Systems

F. Section 27 10 00 – Communications Cabling General Requirements

G. Section 27 11 00 – Communications Equipment Room Fittings

H. Section 27 13 00 – Communications Backbone Cabling

I. Section 27 16 00 – Communications Connecting Cords

J. Section 27 18 00 – Communications Labeling and Identification

K. Section 27 40 00 – AV/Multimedia General Requirements

L. Section 27 41 00 – Campus Multimedia Systems (CMS)

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

O. Section 28 13 00 – Security and Access Control Systems

P. Section 28 16 00 – Video Surveillance Systems

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

PART 2 - PRODUCTS

2.1 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.

2.2 CATEGORY 6 AND 6A HORIZONTAL COPPER CABLES

A. This specification defines the requirements for commercially available high performance category cables.

B. Horizontal cabling for data and video surveillance circuits shall be 23 AWG, 4-pair U/UTP, NEC/NFPA CMP rated and be independently verified for compliance. This cable shall be suitable for installation in free-air, in building risers, in conduit, and/or in cable tray and shall carry CMP plenum rating.

C. The cable design described herein shall exceed transmission performance of category cables. Cable performance shall be independently verified by ETL and meet the ANSI/TIA/EIA-568-C.2 Category 6 and IEEE 802.3af (POE) requirements.

01	Cat6	Sweep tested to 250MHz
02	Cat6A	Sweep tested to 500MHz

D. Cable shall be Underwriters Laboratory (UL) listed, independently verified for flammability by UL, and shall comply with NEC article 800 and NFPA 70.

E. Cables shall 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.

F. Cable shall be packaged on a 1000ft spool.

G. All cables, termination components, support hardware, and equipment shall be furnished, tested, installed and wired by the Contractor.

H. All underground or below grade cable shall be indoor/outdoor, plenum rated cabling suitable for wet locations and direct burial.

01 This applies to cables routed below grade both inside and outside the building, for example data cabling run below grade to a floor box and half height wall shall be indoor/outdoor, plenum rated no exceptions.

I. All horizontal data cables shall terminate on modular patch panels in the telecommunications closet as specified in these documents except OSP cabling which shall require an intermediate OSP-to-plenum splice point.

J. All horizontal data cables shall terminate on modular patch panels in the telecommunications closet as specified in these documents.

K. Jacket color:

01	**TYPICAL**	**BLUE**
02	**SECURITY CAMERAS**	**GREEN**
03	**WIRELESS ACCESS POINTS**	**ORANGE**
04	**PA ADMINISTRATIVE DESK PHONE (ADP)**	**WHITE**
05	**OUTSIDE PLANT RATED**	**BLACK**

L. 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.

M. Approved Manufacturers:

01 Panduit

a.	Cat6 Plenum Rated	PUP6004xx-WLPZ
b.	Cat6 Indoor/Outdoor Plenum Rated	
c.	Cat6 Outside Plant Rated	PUO6C04BL-CEG

02 Commscope

a.	Cat6 Plenum Rated	CS34P
b.	Cat6 Indoor/Outdoor Plenum Rated	CS34P-IO
c.	Cat6 Outside Plant Rated	CS34O

03 Other equivalent products that meet these specifications and warranty with prior written approval.

2.3 INFORMATION OUTLET

A. General

01 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.

02 SIOs shall be mounted (1) where existing boxes are in place, (2) on surface mount raceway typically in surface raceway with barrier, (3) on floor mount interface boxes, or (4) on power poles either currently owned or new.

03 The telecommunications outlet frame shall accommodate or incorporate the following:

a. Installation of modular jacks when installed on a wall-mounted assembly, quantity as indicated in the drawings and specifications.

b. A mechanism for adjusting the surface plate to a plumb position.

04 Multiple jacks are identified in close proximity on the Drawings. The Contractor shall determine the optimum compliant configuration based on the products proposed.

05 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 Jack

01 Data jacks shall be non-keyed 8-pin modular jacks.

02 Termination components shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

03 Jacks shall utilize a four-layer printed circuit board to control NEXT.

04 Jack housings shall fully encase and protect printed circuit boards and IDC fields.

05 Modular jack contacts shall accept 2500 plug insertions.

06 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.

07 Modular jack contacts shall be constructed of Beryllium copper for maximum spring force and resilience.

08 Contact Plating shall be a minimum of 50 micro inches of gold in the contact area over 50 micro-inch of nickel, compliant with FCC part 68.5.

09 Jack termination shall be110 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 Jacket color:

a.	**TYPICAL**	**BLUE**
b.	**SECURITY, ACCESS CONTROL, AND CCTV**	**GREEN**
c.	**WIRELESS ACCESS POINTS**	**ORANGE**
d.	**FIRE ALARM PANEL**	**RED**
e.	**EMERGENCY RESPONDER RADIO SYSTEM**	**RED**
f.	**SECURITY PANEL**	**RED**

g. **PA SYSTEM** **WHITE**

h. **BUILDING AUTOMATION SYSTEM (BAS)** **YELLOW**

17 Jacks shall be marked as either T568A or T568B wiring.

18 Approved Manufacturers:

a. Panduit

1) Cat 6 CJ688TGxx

b. Commscope

1) Cat 6 UNJ600-xx

c. Other equivalent products that meet these specifications and warranty with prior written approval.

C. Outlet Faceplates

01 Faceplates shall be stainless steel and incorporate recessed designation strips at the top and bottom of the frame for identifying labels. Designation strips shall be fitted with clear plastic covers.

02 Any unused jack positions shall be fitted with a removable blank inserted into the opening.

03 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.

04 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 (1) voice jack as defined below, mount on a standard single gang outlet box or bracket, and include mating lugs for wall phone mounting.

05 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.

06 Contractor shall coordinate with GC to match faceplates finish with Electrical outlets finish.

07 Faceplates shall be manufactured by modular jack manufacturer.

08 Approved Manufacturers:

a. IP Phone Wall Plates

1) 1-Port

i. Cisco (CFCI) CP-7800-WMK

ii. Provide the specified Cisco phone plate, no exceptions.

b. 1-Port PA Administrative Desk Phone (ADP)

1) Knee Space:

i. Panduit KWPK6

ii. Commscope M10LWSP

2) Wall Phone

i. Panduit KWPK6

ii. Commscope M10LW4SP

3) Provide silk screening or engraving identifying ADP faceplates, reference drawings.

c. Data Outlet Plates

1) 6-port Plates

i. Panduit CFP6SY

ii. Commscope M16SP-L

2) 2-port Plates (Interior Wall Mounted WAPs only)

i. Panduit CFP6SY

ii. Commscope M12SP-L

d. Other equivalent products that meet these specifications and warranty with prior written approval.

D. Surface Mount Interface Box

01 Low profile, 2-port, surface mount boxes shall incorporate recessed designation strips at the top for identifying labels. Designation strips shall be fitted with clear plastic covers.

02 The box shall feature built-in cable management for both fiber and copper applications.

03 Any unused jack positions shall be fitted with a removable blank inserted into the opening.

04 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.

05 The box shall have the capability to incorporate optional magnets that can be internally mounted.

06 Surface mount box shall be manufactured by modular jack manufacturer.

07 Approved Manufacturers:

a. Panduit CBX2WH-AY

b. Commscope SMB-2P-262

c. Other equivalent products that meet these specifications and warranty with prior written approval.

2.4 OSP-TO-PLENUM RATED CAT6 SPLICE POINT

A. All underground or below grade cable shall be indoor/outdoor, plenum rated cabling suitable for wet locations and direct burial.

01 Where this cannot be achieved then all underground or below grade cable shall be OSP rated and shall require an OSP-to-plenum rated splice point in an accessible location where it enters the building.

02 OSP cable shall not be terminated directly to the equipment racks.

B. Below Grade OSP Cabling:

01 Provide a punch down block in an enclosure adjacent to the conduit stub up to transition from OSP to plenum rated cabling.

02 Plenum rated cable shall be then run to the appropriate data closet.

03 Each splice point and both ends of the cables shall be identified with port number and purpose matching as built conditions.

04 Punch down block shall be no more than 3ft from the stub up location and no more than 18” above the ceiling.

05 Under no circumstances shall plenum rated cable be routed below grade nor shall OSP rated cable be routed through the building.

C. Cat 6 Connection Box

01 110 terminations with a snap on white cover.

02 Complies with TIA/EIA Cat 6 standards.

03 Dual strain relief brackets on cable connections.

04 Double sided tape mounting.

05 Approved Manufacturers:

06 Allen Tell AT66CB-15

07 Other equivalent products that meet these specifications and warranty with prior written approval.

2.5 ETHERNET WITH POWER OVER ETHERNET (POE) UTP SURGE SUPPRESSOR

A. The Contractor shall provide and install a remote surge protector for all exterior mounted wireless access points and cameras at the cable entry point into the building.

01 WAPs and cameras that are not attached to the building or reach above the building roof line shall have a surge protector at the WAP 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. Shielded RJ-45 jacks and ground stud

D. Connect ground directly to building steel or ground.

E. Do not use shielded cable on the horizontal cable run to the MC/IC.

F. Maximum supported data rate: 10,000Mb/s (10 Gigabit)

G. Supports IEEE 802.3af (PoE)

H. UL 497B listed

I. Approved Manufacturers:

01 When protector is mounted in interior, dry, or weather sealed enclosure:

a. Max Peak Surge Current of 30A per pair.

b. Clamping Voltage of 72 Volts.

c. CAT6A 110-RJ45 Suppressor

1) Ditek DTK-110RJC6APOE

02 When protector is exposed to weather or moisture:

a. Max Peak Surge Current of 20kA per pair.

b. Clamping Voltage of 75 Volts common mode, 7.22V differential mode.

c. NEMA 4X CAT6A RJ45-RJ45 Suppressor

1) Ditek DTK-MRJPOEX

03 Multi-channel rack mounted SPD devices equal to above shall be acceptable when mounted in telecom racks and cabinets.

04 Provide POE or POE extender type SPDS matching cabling/circuits to be protected.

05 Other equivalent products that meet these specifications and warranty with prior written approval.

2.6 ETHERNET WITH POWER OVER ETHERNET (POE) UTP EXTENDER

A. The shall provide PoE UTP extenders for out-of-distance communications devices.

B. Shall support IEEE 802.3af (PoE) and IEEE 802.3at (PoE+) and PoE++ up to 74W on input and output.

C. Extends cable range up to 3,000ft over UTP Cables.

D. No configuration required.

E. No power supply required.

F. Maintains full-rate network throughput.

G. Manufacturer:

01 Vigitron Midspan Vi2300A (Interior Mounted Only)

02 Vigitron Midspan Vi2301A (Interior Mounted Only)

03 Vigitron Midspan Vi2300W

04 Or approved equal

2.7 ADDITIONAL MODULES FOR COPPER CABLING

A. Additional modules for copper cabling shall be provided as required:

01 50 and 75 Ohm BNC coax coupler modules, male-male

02 F-type coax coupler module, male-male threaded

03 RCA connector modules with black, red, yellow, and white inserts

04 Solder, pass-through and punch-down termination types

05 S-Video connectors modules - coupler and punch-down termination types

06 Blank module to reserve space for future additions

B. The connectors shall be designed to allow snap-in installation into the outlet faceplates.

PART 3 - EXECUTION

3.1 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:

01 Be capable of certifying Category 5E, 6 and 6A permanent links.

02 Have a dynamic range of at least 100dB to minimize measurement uncertainty.

03 Be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

04 Include S-band time domain diagnostics for NEXT and return loss.

05 Be capable of running individual NEXT, return loss, etc., measurements in addition to AutoText.

06 Include a library of cable types, stored by major manufacturer.

07 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.

3.2 CABLE SUPPORT

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. 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.

G. 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.

H. Cable bundles including voice/data cabling shall not have plastic cable ties.

I. All cable trunks shall have radius controlled cable waterfalls where trunk drops from conduit, sleeve or tray from horizontal path to vertical path.

3.3 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 MER/TR 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 MER/TR 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. The minimum station cable drop length for UTP cables shall be no less than 60 feet. The Contractor shall install station cabling in a fashion to avoid runs less then 60 feet. If cable slack is required to accommodate the minimum length requirements, the Contractor is responsible for storing the slack in a fashion as to protect the cable from damage. The cable slack shall be secure above the ceiling tiles in a figure 8 form by means of J-hooks or D-rings anchored to the building structure. The cable slack shall be coiled to maintain from 100% to 200% of the cable recommended minimum bend radius. Multiple cables may share a common support.

G. All cables shall be installed splice-free unless otherwise specified.

H. 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.

I. Avoid abrasion and other damage to cables during installation.

J. All cable shall be free of tension at both ends. In cases where the cable shall bear some stress, Kellem grips may be used to spread the strain over a longer length of cable.

K. Where installed free-air, installation shall consider the following:

01 Cable shall run at right angles and be kept clear of other trades' work.

02 Cables shall be supported according to code, using "J-hooks" anchored to ceiling concrete, walls, piping supports, or structural steel beams.

03 Hooks shall be designed to maintain cable bend to larger than the minimum bend radius (typically 4 x cable diameter).

04 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.

L. Cable shall never be laid directly on the ceiling grid.

M. Cables shall not be attached to existing cabling, plumbing, or steam piping, ductwork, ceiling supports, or electrical or communications conduit.

N. 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.

O. 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.

P. Service Loops:

01 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.

02 A coil of three feet in each cable shall be placed in the ceiling at the last support (e.g., J-hook) on the patch panel end before the cables land on the cable tray.

03 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.

04 Provide service loops for equipment such as cameras, WAPs, etc. as indicated on the drawings.

05 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.

Q. To reduce or eliminate EMI, the following minimum separation distances from ≤480V power lines shall be adhered to:

01 Twelve (12) inches from power lines of <5-kV

02 Eighteen (18) inches from high voltage lighting (including fluorescent)

03 Thirty-nine (39) inches from power lines of 5-kV or greater

04 Thirty-nine (39) inches from transformers and motors

R. All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.

3.4 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:

01 Standard Voice & Data Outlet (SIO) shall match adjacent electrical outlets.

02 Wall-Mounted Telephone Outlet (Standard Voice only) shall meet ADA requirements.

03 Above ceiling biscuit style outlets and surge protectors shall be supported by or anchored to ceiling concrete, walls, piping supports, or structural steel beams. Outlets shall in no cases be laid directly on the ceiling grid.

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.

3.5 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.

C. Cable Termination – Data/Voice UTP

01 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.

02 Data patch panels shall be sized to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.

03 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.

D. Cable Termination – Fiber Optic

01 All fibers shall be terminated using the specified connector type.

02 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.

03 All couplings shall be fitted with a dust cap.

04 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”).

05 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.

06 Contractor shall install a plastic twist-on bushing on each end of interlocking armored fiber to protect cable from sharp edges of the armor.

3.6 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:

01 The identification of the link in accordance with the naming convention defined in the overall system documentation.

02 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).

03 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).

04 The date and time the test results were saved in the memory of the tester.

3.7 COPPER STATION CABLES

A. Station cabling testing shall be from the jack at the outlet in the work area to the termination block on which the cables are terminated at the MDF or IDF.

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:

01 Length

02 Attenuation

03 Pair to Pair NEXT

04 ACR

05 PSNEXT Loss

06 Return Loss

07 Pair to Pair ELFEXT Loss or ACRF

08 PSEFEXT Loss or PS-ACRF

09 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:

CATEGORY 6 (Permanent LINK)					
Freq (MHz)	Insertion Loss	NEXT Loss Pair to Pair	PS-Next Loss (DB; Worst Case)	ELFEXT Loss Pair to Pair (dB)	PSELFEXT Loss (dB)
1	1.9	65.0	62.0	64.2	61.2
4	3.5	64.1	61.8	52.1	49.1
8	5.0	59.4	57.0	46.1	43.1
10	5.5	57.8	55.5	44.2	41.2
16	7.0	54.6	52.2	40.1	37.1
20	7.8	53.1	50.7	38.2	35.2
25	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	18	41.8	39.3	24.2	21.2
200	26.1	36.9	34.3	18.2	15.2
250	29.5	35.3	32.7	16.2	13.2

CATEGORY 6A (Permanent LINK)					
Freq (MHz)	Insertion Loss	NEXT Loss Pair to Pair	PS-Next Loss (DB; Worst Case)	ELFEXT Loss Pair to Pair (dB)	PSELFEXT Loss (dB)
1	1.9	65.0	62.0	64.2	61.2
4	3.5	64.1	61.8	52.1	49.1
8	5.0	59.4	57.0	46.1	43.1
10	5.5	57.8	55.5	44.2	41.2
16	7.0	54.6	52.2	40.1	37.1
20	7.8	53.1	50.7	38.2	35.2
25	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	18	41.8	39.3	24.2	21.2
200	26.1	36.9	34.3	18.2	15.2
250	29.5	35.3	32.7	16.2	13.2
300	32.7	34.0	31.4	14.6	11.6
400	38.5	29.9	27.1	12.1	9.1
500	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 27 15 00

SECTION 27 16 00 - COMMUNICATIONS CONNECTING CORDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 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.

1.3 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 27 00 00 – General Communication Systems Requirements

C. Section 27 00 10 – Communications Systems Closeout Requirements

D. Section 27 05 26 – Grounding and Bonding for Communications Systems

E. Section 27 05 28 – Pathways for Communications Systems

F. Section 27 10 00 – Communications Cabling General Requirements

G. Section 27 11 00 – Communications Equipment Room Fittings

H. Section 27 13 00 – Communications Backbone Cabling

I. Section 27 15 00 – Communications Horizontal Cabling

J. Section 27 18 00 – Communications Labeling and Identification

K. Section 27 40 00 – AV/Multimedia General Requirements

L. Section 27 41 00 – Campus Multimedia Systems (CMS)

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

O. Section 28 05 44 – Emergency Responder Radio Antenna System

P. Section 28 10 00 – Physical Security General Requirements

Q. Section 28 13 00 – Security and Access Control System

R. Section 28 16 00 – Video Surveillance System

S. Section 28 46 00 – Fire Detection and Alarm

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

PART 2 - PRODUCTS

2.1 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 0000.

2.2 CATEGORY 6 PATCH CORDS

A. The Owner has the right to determine the final length of the patch cords after the contract is awarded.

B. All Category 6 UTP patch cords shall be round and consist of eight insulated 23 AWG, 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. Category 6 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 Category 6 cords available by connectivity manufacturer.

F. Patch cord color coding shall match the jack/purpose color at both the racks and

device/remote end:

01	**TYPICAL**	**BLUE**
02	**SECURITY CAMERAS**	**GREEN**
03	**WIRELESS ACCESS POINTS**	**ORANGE**
04	**FIRE ALARM PANEL**	**RED**
05	**EMERGENCY RESPONDER RADIO SYSTEM**	**RED**
06	**SECURITY PANEL**	**RED**
07	**PA SYSTEM**	**WHITE**
08	**BUILDING AUTOMATION SYSTEM (BAS)**	**YELLOW**

G. Approved Manufacturers:

01 Panduit

a.	Cat6 UTP Low Diameter	TX6 UTPSPxxyyY
b.	Cat6 F/UTP OSP	
c.	Cat6 S/FTP	

02 Commscope

a.	Cat6 UTP Low Diameter	UC1BBB2-yyxx
b.	Cat6 F/UTP OSP	CO11152-yyxx
c.	Cat6 S/FTP	UC111F2-yyxx

03 Where xx is the length and yy is the color.

04 Other equivalent products that meet these specifications and warranty with prior written approval.

H. This Contractor shall provide the following patch cords (for pricing purposes only; see section 3.1 below):

Qty	Color	Length	Type	Notes
xx	Blue	5 feet	Cat6	1 Cord for every 2 horizontal data cables installed
xx	Blue	7 feet	Cat6	1 Cord for every 2 horizontal data cables installed
xx	Blue	10 feet	Cat6	1 Cord for every horizontal data cable installed
xx	Orange	Varies	Cat6	One (1) 10ft cord for every interior ceiling mounted AP installed. One (1) 6in cord for every interior wall mounted AP installed.
xx	Orange	≥10 feet	Cat6 F/UTP	1 Cord for every exterior WAP installed. Field verify length from exterior WAP to surge protector in nearest accessible ceiling, minimum length 10ft.
xx	Green	10 feet	Cat6	1 Cord for every interior camera horizontal cable installed
xx	Green	≥10 feet	Cat6 F/UTP	1 Cord for every exterior camera installed. Field verify length from exterior camera to surge protector in nearest accessible ceiling, minimum length 10ft.
xx	Red	3 feet	Cat6	1 Cord for every fire alarm, security, or emergency responder radio horizontal cable installed.
xx	White	3 feet	Cat6	1 Cord for every PA system horizontal data cable installed.
xx	White	10 feet	Cat6	1 Cord for every PA system horizontal data cable installed.
xx	Yellow	3 feet	Cat6	1 Cord for every building automation system (BAS) horizontal data cable installed.
xx	Varies	1 foot	Cat6	1 Cord for every CAT6 horizontal cable installed (use at MDF and IDF for patching to the network switches)
xx	Blue	xx feet	Cat6	Additional cords as required by the non-Division 28 contractors to interconnect all miscellaneous components of their systems. Coordinate during bidding period.
xx	Green	xx feet	Cat6	Additional cords as required by the Division 28 contractors to interconnect all miscellaneous components of the Division 28 systems. Coordinate with during bidding period.

I. This Contractor shall provide the following spare patch cords:

Qty	Color	Length	Type	Notes
10	Blue	10 feet	Cat6	
10	Orange	10 feet	Cat6	
5	Orange	10 feet	Cat6F/UTP	
10	Green	10 feet	Cat6	
5	Green	10 feet	Cat6F/UTP	
5	Red	3 feet	Cat6	
5	White	10 feet	Cat6	
5	Yellow	3 feet	Cat6	
30	Varies	1 foot	Cat6	Provide quantity five (5) of each color.

2.3 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 fiber optic patch cords shall:

01 Be duplex 2-3mm tight buffer design with Yellow (OS2) jacket.

02 Have SC-SC connectors with straight thru connectors (A-A Polarity).

03 Have ultra physical contact (UPC) fiber connectors.

04 Have matching OS2 core.

C. Approved Manufacturers:

01 Single Mode (OS2)

a. Commscope

1) SC-SC Connector FEWSCSC42-JXxx

2) LC-LC Connector FEWLCLC4242-JXFxx

02 Where xx is the length.

03 Other equivalent products that meet these specifications and warranty with prior written approval.

D. This Contractor shall provide the following patch cords for each closet (for pricing purposes only; see section 3.1 below):

Qty	Length	Type	Notes
24	1 meter	SC-SC Non-Plenum	Match installed fiber type. Unused fiber patch cords to be delivered to the Owner.
24	2 meter	SC-SC Non-Plenum	Match installed fiber type. Unused fiber patch cords to be delivered to the Owner.

PART 3 - EXECUTION

3.1 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 27 16 00

SECTION 27 18 00 - COMMUNICATIONS LABELING AND IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 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:

01 Equipment room backboards and equipment racks

02 Station cable and terminating equipment

03 Telecommunications grounds and related components

1.3 RELATED WORK

A. Section 26 05 00 – Common Work Results for Electrical

B. Section 27 00 00 – General Communication Systems Requirements

C. Section 27 00 10 – Communications Systems Closeout Requirements

D. Section 27 05 26 – Grounding and Bonding for Communications Systems

E. Section 27 05 28 – Pathways for Communications Systems

F. Section 27 10 00 – Communications Cabling General Requirements

G. Section 27 11 00 – Communications Equipment Room Fittings

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 – Campus Multimedia Systems (CMS)

N. Section 27 41 50 – Local Sound Systems

O. Section 27 51 00 – Campus Communications Systems

P. Section 28 05 44 – Emergency Responder Radio Antenna System

Q. Section 28 10 00 – Physical Security General Requirements

R. Section 28 13 00 – Security and Access Control System

S. Section 28 16 00 – Video Surveillance System

T. Section 28 46 00 – Fire Detection and Alarm

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

PART 2 - PRODUCTS

2.1 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.

2.2 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. 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 fiber count and (2) destination information. An example of a compliant product is VIP Products’ “Caution Write-On Coverall Tag.”

PART 3 - EXECUTION

3.1 WARRANTY

A. Refer to Section 27 00 00 for additional requirements. General

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.

3.2 LABELING OF CABLING AND TERMINATION COMPONENTS

A. BACKBOARD AND EQUIPMENT RACKS

01 Backboards and equipment racks shall be labeled by the Contractor identifying the telecommunication room. Additionally, equipment racks shall have an number after the room number unique to that particular communications room. For example, A-1 would be the first rack in MDF-1A.

02 Character height shall be 1-inch (minimum).

B. PATCH PANELS:

01 All data patch panels shall be clearly labeled indicating the telecommunication room number, the data patch panel letter designation, and the data port number on the data patch panel (ports 1 through 24 or 48).

02 A data port schedule for each telecommunication room shall be created in spreadsheet format (Excel) with the telecommunication room number, data patch panel 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.

03 Refer to 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.

04 Each patch panel shall have a letter designation starting with data patch panel ‘A’ in each telecommunication room and continue through the alphabet.

05 Each patch panel shall have all ports factory numbered from 01-24 or 01-48.

06 Contractor shall provide machine labels for each port in addition to factory labeling as follows:

a. Labels shall be of the form XY ## in the same fashion as cable and data outlet labeling:

1) X is the closet designation, MDF = A, IDF1 = B, IDF2 = C, etc.

2) Y is the patch panel designation, A = 1, B = 2, C = 3, etc.

3) ## is the patch panel port number.

4) For example MDF, patch panel 1, port 1 shall be designated as AA01.

5) Ports serving WAPs shall be labeled as WAP XY ##.

6) Ports serving Video Surveillance Cameras shall be labeled as CAM XY ##.

b. This format will apply for all data drops in the building (cameras, WAPs, general data, wall phones…etc.

c. Confirm data closet designation at each room prior to beginning work.

C. CABLING

01 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).

02 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).

03 Cabling label shall match patch panel data port designations designation.

D. FIBER OPTIC BACKBONE, RISER CABLES, AND TERMINATION COMPONENTS

01 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.

02 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.

E. STANDARD INFORMATION OUTLET (SIO) FACEPLATES

01 All faceplates shall be clearly labeled indicating the destination of the cable(s) (telecommunication room number), the data patch panel(s) letter designation, the data port number(s) on the data patch panel(s), and the voice cable number(s).

02 Telecommunications outlets are to be labeled (1) on the cover of the assembly and (2) on each cable terminated at that location.

03 Station cables shall be labeled within two inches of the cable end.

04 Cabling and data outlet labeling:

F. FIBER OPTIC CABLES AND TERMINATION COMPONENTS

01 All fiber optic cables, termination enclosures and connector panels, and splice closures shall be clearly labeled.

02 In addition, labeling of all fiber optic cables shall include the number of fibers in the cable.

03 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.

04 Telecom room number will be identified in a single letter format example:
MDF=A
IDF1=B
IDF2=C…etc.

G. GROUND SYSTEM LABELING

01 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 27 18 00

SECTION 27 40 00 - AV & MULTIMEDIA GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Technology Requirements as specified in Section 27, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA and ANSI Standards and be so labeled.

E. Provide Shop Drawings per Section 27 00 00.

1.2 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.

1.3 RELATED WORK

A. Section 27 00 00 – General Communication Systems Requirements

B. Section 27 00 10 – Communications Systems Closeout Requirements

C. Section 27 05 26 – Grounding and Bonding for Communications Systems

D. Section 27 05 28 – Pathways for Communications Systems

E. Section 27 41 00 – Campus Multimedia Systems (CMS)

F. Section 27 41 50 – Local Sound Systems

G. Section 27 51 00 – Campus Communications Systems

1.4 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.5 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.

1.6 REFERENCE STANDARDS AND CODES

A. Giddings, G. H. Philip. Audio Systems – Design and Installation.
Focal Press, 1990.
Focal Press, Elsevier Inc.
30 Corporate Drive, Suite 400
Burlington, MA 01803

B. AV Installation Handbook, Second Edition.
InfoComm International, 2009.
11242 Waples Mill Road, Ste.
200 Fairfax, VA 22030

C. Audiovisual Systems Performance Verification (ANSI/Infocomm 10:2013) InfoComm International, 2013.
11242 Waples Mill Road, Ste. 200
Fairfax, VA 22030
http://www.infocomm.org/cps/rde/xchg/infocomm/hs.xsl/35975.htm

D. Dashboard for Controls Template, Design Reference, and Integrators Guide.
InfoComm International
www.infocomm.org/cps/rde/xchg/infocomm/hs.xsl/35324.htm

1.7 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 a installing technician role, holding at least one of the follow certifications:

01 CTS (InfoComm International)

02 CTS-I (InfoComm International)

03 CTS-D (InfoComm International)

04 EST-L2 (National Systems Contractor Association)

C. Refer to subsequent sections for section specific qualification requirements.

1.8 PRE-CONSTRUCTION SUBMITTALS

A. Structurally Mounted Elements: Including but not limited to monitors, projectors, projection screens, and loudspeakers.

B. Frequency Assignment Plans: Provide for all wireless microphones.

C. Custom Engraving: Layout and labeling/engraving of custom products including wall plates and interconnection panels. Provide engraving detail with material and finish detail.

D. 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.

1.9 CONSTRUCTION PROGRESS SUBMITTALS

A. Refer to Section 27 00 00 for additional requirements.

1.10 CLOSEOUT SUBMITTALS

A. 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

01 Upon Owner approval, Contractor shall provide two (2) laminated copies and one (1) digital copy for each room/system type.

B. 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.

1.11 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

2.1 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.

2.2 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.

2.3 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.

2.4 POWER DEVICES

A. Refer to Section 27 00 00 for additional requirements.

B. All audio amplifiers shall be on sequenced outlets.

2.5 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. All cables run beneath raised floor shall be plenum-rated.

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 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.

2.6 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. DX, DX-LINK: Shall be AMX shielded RJ-45 and fiber connectors, as recommended by manufacturer of DX or DX-LINK system. Schedule: Contractor shall submit schedule prior to installation for Consultant review indicating connectors that will be used on the project.

2.7 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.

01 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.

01 All low voltage cabling shall be installed in raceway. Cut-ins shall only be allowed where specifically indicated on the drawings or with prior written approval.

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.

PART 3 - EXECUTION

3.1 EQUIPMENT

A. Safety: Contractor shall use proper structural installation techniques and maintain a minimum 5:1 safety margin.

B. Custom Mounting Finish: Custom mounting hardware shall be painted by Contractor to match either color of wall, ceiling or equipment, at Consultant’s discretion.

3.2 SPARE PARTS AND REMOTE CONTROLS

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.

C. Keys: Contractor shall turnover all keys, tagged and organized by type on individual key rings, to Owner upon project completion.

D. Remote Controls: Contractor shall turnover all remote controls with batteries installed to Owner upon project completion.

E. Refer to individual sections for spare parts requirements.

3.3 EDID AND E-EDID

A. Contractor shall confirm that all wired pathways are passing EDID information and auto-setting to the proper device\ display common resolution.

3.4 INTERCONNECTION

A. 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.

B. 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.

C. Exceptions: Contractor shall not be responsible for unrelated low voltage wiring such as data and voice connections except as they pertain to interface boxes, interface plates, and integrated control systems.

3.5 CABLE MANAGEMENT

A. As required by Section 27 00 00.

01 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.

02 Not on Ceiling: Cabling shall not lie on the ceiling.

03 Wall Cabling: Cables installed in a horizontal fashion along wall surfaces shall be installed in surface raceway approved by Owner and Consultant.

04 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.

05 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.

06 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.

07 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.

a. 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.

08 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).

3.6 CONNECTOR TERMINATION

A. Video Connectors: Video connectors (BNC, RCA, and F) shall be terminated using a crimp tool or dies designed specifically for the connectors being applied.

B. XLR Connectors: Terminate XLR type connectors wired pin 2 high, pin 3 low, and pin 1 shield.

C. UTP: UTP cable shall be terminated with appropriate crimps tools or tools specified by manufacturer. Refer to 27 40 00, 2.05 Connectors.

3.7 GROUNDING

A. Fixed 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.

3.8 TESTING & INSPECTION

A. Notification: Prior to start of testing, provide a list to Consultant of test equipment make, model numbers and calibration dates that will be used.

B. Testing: Contractor shall perform complete testing on system before inspection. Selected systems may be retested during inspection at Owner's discretion.

C. 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.

D. Wiring and Labeling: Contractor shall check all inputs and outputs for correct wiring and labeling.

E. 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.

3.9 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.

3.10 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.

3.11 PROJECT CLOSEOUT

A. Completion: System shall be considered complete when all of the following has occurred:

01 Testing has been completed to the satisfaction of Owner and Consultant.

02 Punch-listed items have been addressed to the satisfaction of Owner.

03 As-built drawings and system documentation has been turned over to Owner and Consultant.

04 Complete operational training has been conducted with Owner's staff.

05 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 27 40 00

0SECTION 27 41 00 - CAMPUS MULTIMEDIA SYSTEMS (CMS)

PART 1 - GENERAL

1.1 SCOPE-OF-WORK SUMMARY

A. Unless otherwise noted, the terms “Contractor”, “Offeror”, and “Proposer” are used interchangeably herein and refers to the respondent submitting a proposal for this RFP Section of Work.

B. The Proposer Shall:

01 Provide Equipment, Cable, and Devices described herein or depicted in the construction drawings.

02 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.

03 Integrate into the construction any existing or owner furnished equipment and miscellaneous hardware as may be described herein.

04 Maintain timely installations according to the project construction schedule.

05 Provide Owner Training, As-Built 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:

01 Campus Multimedia Systems, as follows:

a. Classroom AV/multimedia presentation systems

b. Conference Room AV/multimedia presentation systems

c. Special space AV/multimedia presentation systems in the following spaces:

1) Gym & Cafeteria

2) Computer Classroom & Large Group Instruction (LGI)

d. Classroom/Instructional Sound Reinforcement Systems

e. Digital signage flat panel displays

1.2 RELATED DIVISIONS, SECTIONS, AND DOCUMENTS

A. References to the following related documents do not limit or release the Contractor from the responsibility of having the necessary knowledge of other non-referenced related documents that makeup the Construction Document Package.

B. The following Contract Documents are hereby made a part of this Section:

01 Division 1 Documents found in the Project Manual

02 Division 26 Documents that collectively make up the Construction Package including:

a. Section 26 05 00 – Common Work Results for Electrical

03 Division 27 Documents that collectively make up the Construction Package including:

a. Section 27 00 00 – General Communication Systems Requirements

b. Section 27 00 10 – Communications Systems Closeout Requirements

c. Section 27 05 26 – Grounding and Bonding for Communications Systems

d. Section 27 05 28 – Pathways for Communications Systems

e. Section 27 40 00 – AV/Multimedia General Requirements

f. Section 27 41 50 – Local Sound Systems

g. Section 27 51 00 – Campus Communications Systems

04 Work diagrammatically shown or noted on project drawings

05 Other documents that collectively make up a part of this Construction Document package.

1.3 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.

01 Work by the General Contractor

02 Work provided by Owner or Owner's Contractors

03 Work by other Division 27 Subcontractors

a. Division 27 Structured Cabling Subcontractor

b. Division 27 Local Sound System Subcontractor

c. Division 27 Campus Communications Systems Subcontractor

04 Work by Electrical Subcontractor

a. 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

b. The (CMS) Contractor shall examine construction documents for familiarization of the provided Electrical Rough-in by the Electrical Contractor

c. 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

1.4 PERFORMANCE REQUIREMENTS & REFERENCES

A. Referenced standards and / or procedures will be binding on Contractor and all work will be judged against such standards and procedures unless otherwise stated in writing.

B. The Contractor shall be held responsible for and adhere to Manufacturers' installation recommendations and guidelines.

C. Other Reference Standards:

01 Audio Engineering Society (AES) Standards

02 BICSI/InfoComm International AVDRAM (AV Design Reference Manual)

03 ISO / ICS 33.160.01 through 33.160.99

1.5 SUBMITTALS

A. Reference Section 27 00 00

PART 2 - PRODUCTS & SERVICES

2.1 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 turnkey 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

01 The Proposer shall provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.

02 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.

03 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.

04 The Proposer shall receive no allowances because of omissions in work due to unfamiliarity or their misunderstanding of Proposal package.

G. Drawing Symbols

01 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.

02 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

01 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:

a. 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

01 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.

2.2 MANUFACTURERS

A. Governing Clauses

01 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.

02 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.

03 The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specified system standards.

04 If the proposed system does not meet all of 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.

05 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.

06 Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

2.3 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.

2.4 CAMPUS MULTIMEDIA SYSTEMS (CMS)

A. General

01 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.

B. Video Projectors and Displays

01 Reference Display Schedule in the drawings for type and whether OFCI or CFCI.

C. Video Display Mounting

01 Typical Classroom: Mobile Interactive Flat Panel

02 Science Classrooms: Mobile Interactive Flat Panel

03 Computer Classrooms: Ceiling Mounted Projector

04 Large Group Instruction Room: Ceiling Mounted Projector

05 Typical Conference Room w/ Display: Wall mounted Interactive Flat Panel

06 Typical Office w/ Display: Wall mounted Interactive Flat Panel

07 Stage: Rear projector mounted from structure above stage.

08 Digital Display: Wall mounted Flat Panel

09 Reference Display Schedule in the drawings for mount whether OFCI or CFCI.

D. Typical Instructional Space Multimedia System

01 The above described video display system shall receive video signals from a Teacher's Work Station (TWS) and/or Music Room Workstation (MWS) via wireless connection.

02 A classroom sound reinforcement system will also provide multimedia and page override via the LightSpeed TopCAT Access System with quantity of ceiling speakers shown on the plans, (2) Flexmikes, and Activate Station with (4) Flex-Pods for all standard learning spaces.

a. Connect TopCAT ceiling speaker power input to local teacher station isolated ground 120V circuit. Coordinate with Division 26 for connection.

03 Each Classroom shall receive the following patch cords:

a. One (1) lot audio cables to connect the teacher's workstation to the sound reinforcement activate station.

04 Reference the drawings for additional information.

E. Typical Science Lab Multimedia System

01 Same as the Typical Instructional Space Multimedia System except the sound reinforcement system shall be provided with (6) Flex-Pods.

F. Typical Computer Classroom or Large Group Instruction (LGI) Room Multimedia System

01 The above described video display system shall receive video signals from a Teacher's Work Station (TWS) HDMI 2.0 or equivalent HDBase-T Extender system.

02 The "TWS" wall plates shall be a typical Dual Gang audio / video input module in a four-gang box. Each input module shall include (1) HDMI 2.0 and (1) USB3.0.

03 The projector A/V plates shall be installed in the ceiling A/V box. Each input module shall include (1) HDMI 2.0, (1) USB3.0, and (1) 3.5mm audio connection.

04 The USB 3.0 extender from the workstation outlet to the projector plate is not required to be over category cable. The acceptable solution (direct cable, fiber extender, etc.) will vary depending on the installation requirements/distances and is left to the contractor to determine their preferred cabling installation to achieve the desired connectivity.

05 The “TWS” input plate with HDMI 2.0 shall be connected to with HDMI 2.0 cable or HDBase-T cable using an extender/receiver pair as recommended by the manufacture based on the necessary cable distances.

a. Where distances permit, the preferred installation is using HDMI 2.0 cable in lieu of an extender/receiver solution.

06 A classroom sound reinforcement system will also provide Multimedia and page override via the LightSpeed TopCAT Access System with quantity of ceiling speakers shown on the plans, (2) Flexmikes, and Activate Station with (4) Flex-Pods for all computer classrooms and LGI rooms.

a. Connect TopCAT ceiling speaker power input to local projector 120V circuit. Coordinate with Division 26 for connection.

07 Video source audio shall be controlled by the display or display’s remote control and be routed to the classroom sound reinforcement system using the 3.5mm audio output on the display wall plate and 3.5mm input on the sound reinforcement system.

08 Where shown as a separable/combinable space, the Computer Classroom and Large Group Instruction rooms shall include an expanded audio video system capable of operating the rooms as separate or a single combined space.

a. Video source shall be distributed using an HDMI auto switcher.

1) Auto switcher shall be controlled from local touch screens.

b. Video source audio shall be controlled and distributed by the local classroom sound reinforcement systems and associated touch screen/remote control.

c. Reference drawings details.

09 Each Computer Classroom and Large Group Instruction Room shall receive the following patch cords:

a. (1) 10’ HDMI 2.0 cable for the teacher workstation

b. (1) 10’ USB 3.0 cable for the teacher workstation

c. Additional A/V cables to connect the projector to the projector plates in the ceiling A/V box.

1) Route cables from A/V box inside the projector support column to projector inputs.

d. Additional audio cables to connect the teacher’s workstation to the sound reinforcement activate station.

10 Reference the drawings for additional information.

G. Typical Conference Room and/or Office System

01 The above described video display system shall receive video signals from a Conference Work Station (CWS) HDMI 2.0 system.

02 The “CWS” plates shall include (1) HDMI 2.0 and (1) USB3.0.

03 The display shall be directly connected to the infrastructure cabling with no wall plate at the display location.

04 The USB 3.0 extender from the workstation outlets to the display is not required to

be over category cable. The acceptable solution (direct cable, fiber extender, etc.) will vary depending on the installation requirements/distances and is left to the contractor to determine their preferred cabling installation to achieve the desired connectivity.

05 Video source audio shall be controlled by the display or display's remote control.

06 Proximity Component Storage Panels

a. Provide quantity and size as required to mount all CFCI, OFCI, and OFOI equipment indicated to be mounted behind the displays.

b. Basis of Design

1) Chief CSSMP15X10 Sliding Storage Panel

2) Chief CSPR (where required for large components)

07 Each Conference Room and/or Office Room with a display shall receive the following patch cords:

a. (1) 10' HDMI 2.0 cable for the conference workstation

b. (1) 10' USB 3.0 cable for the conference workstation

08 Reference the drawings for additional information.

H. Stage

01 The above described video projection system shall receive video signals from the Stage Presenters Stations ("P1" & "P2") 4K HDBase-T 2.0, HDCP2.2 compliant Extender/Receiver system.

02 The "P1" & "P2" wall plates shall be a typical Dual Gang audio / video input module in a three-gang box.

a. The primary presentation station input module "P1" shall include (1) HDMI.

b. The secondary presentation station input module "P2" shall include (1) HDMI.

03 The "P1" & "P2" input plates with HDMI shall be connected to a wall plate mounted in the stage local sound cabinet with HDBase-T cabling using an extender/receiver pair as recommended by the manufacturer based on the necessary cable distances.

a. Where distances permit, the preferred installation is using copper cable in lieu of fiber.

04 Video source shall be distributed using an HDMI auto switcher.

a. Auto switcher shall be tied into the local sound system controls.

b. Reference drawings details.

c. Local sound system provided under 27 41 50.

05 Video source audio shall be controlled and distributed by the local sound system and associated touch screen/remote control.

a. Reference drawings details.

b. Local sound system provided under 27 41 50.

06 The local sound system will also provide Multimedia and page override.

07 The stage shall receive the following patch cords:

a. (2) 15' HDMI cables

b. Audio cables to connect Owner's devices to input plates.

08 Provide associated interconnecting cables for AV Multimedia devices in and connecting to the equipment located at the projector and in the local sound wall mounted equipment cabinet.

I. Typical Digital Display System

01 The above described video display system shall receive video signals from a Digital Signage Media System and the Owner's Local Area Network (LAN).

02 The display digital media player shall be directly connected to the infrastructure cabling with no wall plate at the display location.

03 Video source audio shall be controlled by the display or display's remote control.

04 Proximity Component Storage Panels

a. Provide quantity and size as required to mount all CFCI, OFCI, and OFOI equipment indicated to be mounted behind the displays.

b. Basis of Design

1) Chief CSSMP15X10 Sliding Storage Panel

05 Reference the drawings for additional information.

J. Portable Instructional Speaker Systems

01 Provide TopCAT Activate Systems with the following options each:

a. One (1) Redcat Access with Battery Pack

b. Two (2) Flexmikes

c. Four (4) Speaker Pods

02 Portable Instructional Speaker System shall be delivered to the Owner as part of the spare parts and attic stock turnover.

03 Reference Speaker Schedule and floor plans for locations and quantities.

2.5 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 form certain desired features and functions that the Contractor shall provide with their proposed system solution.

01 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.

02 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.

03 (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.

04 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. Contractor shall also furnish any ancillary equipment, devices, cables, connectors, and hardware necessary to provide a complete and functional system.

2.6 PROVIDE AND INSTALL:

A. Provide equipment, devices, and interconnecting wires & cables as depicted in diagrams of the construction drawings and the following:

B. Schematics

01 Contractor shall provide all components, cables, and accessories necessary for turnkey functional systems 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.

02 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.

C. Classroom and Instructional Spaces Multimedia System

01 Reference Schematics

D. Typical Conference Room Multimedia System

01 Reference Schematics

E. Projectors and Projection Screens

01 Install projectors and screens at the locations indicated on the plans. Installation of all projectors, mounts, and screens are to be included in the scope of 27 41 00 Contractor unless noted otherwise on the display schedule. Reference display schedule for OFCI and CFCI projectors.

02 Acceptable Products:

a. Refer to display schedule in the technology details sheets.

03 All projectors shall be mounted according to the display schedule and any associated details.

a. Where projectors are noted as OFCI the contractor shall furnish all necessary components except the projector and associated mount which shall be provided by the Owner. The Contractor shall remain responsible for providing all components as necessary for a complete system incorporating the Owner provided equipment.

b. Where projectors are notes as CFCI the contractor shall furnish and install those projectors, associated mounts, and all components as necessary for a complete installation.

04 Each “D#” type projector location has unique mounting requirements. For OFCI equipment the Owner shall provide the display and mount information to the Contractor. All other components shall be by the contractor including the wall boxes, ceiling plates, custom columns, etc. The 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 is indicated below to assist the contractor in bidding the project only:

a. Provide an AV installation box for power, data, AV equipment, etc. at each ceiling and wall mounted projector location. The data outlet, local AV equipment, and cabling shall be installed/routed within the in-ceiling box.

1) Classroom ceiling mounted projector AV box with pole mount

i. FSR CB-12P, CB-22P, or equal. (By Division 27)

ii. 1-1/2” NPT custom column length, minimum 6” (By Division 27)

2) Wall mounted projector AV box

i. FSR WB-X2-GNG wall box with locking cover. Color to be selected by architect. (By Division 27)

ii. Height and location to be field coordinated with provided equipment and building conditions.

3) Over stage rear projector mounted from structure

i. Chief CMA 110 Projector Ceiling Mount Plate

ii. Chief CMA-345 Structural Ceiling Adapter with Decoupler

iii. Custom length NPT threaded, powdercoated black, fixed extension column. Field measure length to align with projection screen and avoid conflict with other building elements prior to ordering.

iv. Chief RPAO-G, RPA Series Universal Ceiling Projector Mount

v. Refer to Stage AV System Schematic in the detail drawings. All mounting components by Division 27

vi. Coordinate with Division 26 for power, data, and AV rough-in locations for devices at the projector. Outlet boxes shall not be visible by the audience.

vii. Height and location to be field coordinated with provided equipment and building conditions.

05 Contractor shall be responsible for correctly locating mounts, for both OFCI and CFCI installations, according to each projector’s lens geometry and the location and size of the screen, painted surface, or markerboards being projected onto. Locations indicated on plans are approximate and shall not be misconstrued as instructions for exact mounting locations.

F. Loudspeakers

01 Provide loudspeakers at the locations indicated on the plans.

02 Acceptable products:

a. Refer to loudspeaker schedule in the technology detail sheets.

G. Displays

01 Install displays at the locations indicated on the plans. Installation of all displays and mounts are to be included in the scope of 27 41 00 Contractor unless noted otherwise on the display schedule. Reference display schedule for OFCI and CFCI displays.

02 Acceptable Products:

a. Refer to display schedule in the technology details sheets.

03 All displays shall be mounted according to the display schedule and any associated details.

a. Where displays are noted as OFCI the contractor shall furnish all necessary components except the display and associated mount which shall be provided by the Owner. The Contractor shall remain responsible for providing all components as necessary for a complete system incorporating the Owner provided equipment.

b. Where displays are notes as CFCI the contractor shall furnish and install those displays, associated mounts, and all components as necessary for a complete installation.

04 Each “D#” or “TV” type display location has unique mounting requirements. For OFCI equipment the Owner shall provide the display and mount information to the Contractor. All other components shall be by the contractor including the wall boxes, ceiling plates, custom columns, etc. The 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 is indicated below to assist the contractor in bidding the project only:

a. Display Ceiling/pole mount

1) FSR CB-12, CB-22, or equal. (By Division 27)

2) Chief Mfg. CMA100 ceiling plate (By Division 27)

3) Chief Mfg. 1-1/2” NPT custom column (By Division 27)

4) Chief Mfg. LCM single display mounting plate (By Division 27)

b. Display Wall mount

1) Hubbell NSAB62M 2-gang recessed TV back box with NSAV6C white cover. (By Division 26)

2) Cleartouch UC-CTI-MOUNT-FIXW Mobile Mount (OFCI)

c. Display Cantilever Mount

1) Chief Mfg. PAC526 flat panel pre-wire in-wall box with cover kit (By Division 27)

2) Chief Mfg. TS525T Large THINSTALL Dual Swing Arm Wall Display Mount - 25" Extension universal flat panel tilt display mount (By Division 27)

05 Contractor shall be responsible for correctly locating mounts, for both OFCI and CFCI installations, according to each display’s location and size of the screen. Locations indicated on plans are approximate and shall not be misconstrued as instructions for exact mounting locations.

H. Digital Signage Media Player

01 Digital Signage System equipment shall be Owner Furnished Contractor Installed, one (1) media player per digital display location.

02 The digital signage system shall publish to the displays marked as “TV”. These are located in the drawings. Refer to the electrical floor plans for locations. Provide all cabling, decoders, programming, licenses, etc. as required for a complete installation.

03 System training and programming shall be by Owner.

I. Cafeteria Video Menu Board System

01 Reference Kitchen Plans and Specifications

J. Wall Plates:

01 Provide stainless steel wall plates for typical installations.

02 Typical Classroom “TWS”, “SWS”, etc.… wall plates

a. The Contractor shall submit a sample wall plate for Consultant / Owner review and approval prior to procurement. All audio video plates that are a part of this Section’s Scope-of-Work shall be of like material and color to that of the submitted 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.

03 Acceptable Products, as submitted and approved by Consultant:

a. Crestron

b. COVID

c. Hall Research

d. Cables2Go

e. Or approved equal.

K. Cabling:

01 Where cabling part numbers are shown these are to be considered the basis of design and other listed manufacturers or approved equals shall meet or exceed the properties of the listed cables.

a. Acceptable Products, as submitted and approved by Consultant:

1) Belden

2) Cables2Go

3) COVID

4) Hall Research

5) Hubbell

6) Leviton

7) Liberty Cable

8) Middle Atlantic

9) Or equal with prior approval.

02 All A/V infrastructure cabling shall be **BLACK** in color and be plenum rated.

03 HDBase-T Infrastructure

a. Belden 2183P 4K HDBase-T Copper Cabling

b. Leviton Atlas-X1 CAT6A UTP with alien crosstalk prevention

c. COVID P-C6AF-RJ-BLK-XX CAT6A Shielded

d. Middle Atlantic CAT6A Shielded

e. Hubbell C6AFTPSPB CAT6A FTP Shielded with alien crosstalk prevention

04 USB Infrastructure

a. Corning AOC-ACS2CVAXXXM20

b. Hall Research CUSB3V1-APXX

1) Assist Owner with installing Windows drivers when using this cable.

c. COVID P-USB3-AF-xxACT

05 3.5mm Audio Infrastructure

a. COVID CSP3222-XXM

06 Patch Cables:

a. HDMI 2.0

1) COVID HDPR-XX

b. USB 3.0

1) COVID USB3-YY-XX

c. 3.5mm Audio

1) COVID CSP1222-XXM

07 Provide all associated interconnecting cables and infrastructure cabling for AV Multimedia devices and equipment installed as part of this project.

2.7 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 270010 Closeout Requirements.

B. The contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion as attic stock. No devices shall be used without documentation and written authorization from the Owner's representative.

C. Unused items shall be turned over to the owner within thirty (30) days of substantial completion of the project. Unused material is to be ordered separately when commissioning is scheduled in order to ensure the longest warranty period possible.

D. Contractor shall obtain a signed transmittal of equipment turned over to the owner at the end of the project. The signed transmittal shall be included in the contractor's closeout documents.

2.8 ALTERNATES

A. Alternates shall be identified clearly on the proposal with the associated Alternate number as listed in these documents. State clearly if the alternate is an Additive or Deductive price to the base bid lump sum amount.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor's responsibilities

01 Examine all related construction documents to ensure compliance of them.

02 Examine and coordinate the installation schedule to comply with contracted timeline.

03 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.

04 Failure to make the required examinations shall not result in any additional charges

to the Owner.

3.2 INSTALLATION

A. Requirements and Responsibilities

01 The Contractor shall furnish, deliver, transport, erect, install, configure, and connect completely all of 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.

02 The Contractor shall make this a “Turnkey Project” ready for the Owner’s use.

03 The Contractor shall coordinate with all other trades to avoid causing delays in the installation schedule.

04 In the event of any conflicts, delays or improper preparatory work by other trades, notify the General Contractor, Consultant and Owner.

05 Equipment and enclosures shall be mounted plumb and square in relation to the structure.

06 Provide cut-in boxes or approved clamping rings where back boxes are required but not provided by Electrical Contractor.

a. All low voltage cabling shall be installed in raceway. Cut-ins shall only be allowed where specifically indicated on the drawings or with prior written approval.

07 The Contractor shall coordinate their requirements for proper ground system to all equipment.

08 Coordinate and verify with the Electrical Contractor, the installation of needed cable raceways

09 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 will not be accepted as fasteners.

10 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 with the General Contractor.

11 The Contractor shall not shoot, fasten, or screw hangers to the roof deck. Any exceptions shall be noted or coordinated in writing with the General Contractor.

12 The Contractor shall 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.

13 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.

14 Equipment shall be fabricated with equipment mounted into racks, enclosures, and consoles and be fully wired and tested, before delivery to job site.

15 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.

16 Contractor’s construction, fabrication, installation, or delivery of materials must comply with applicable standards and practices.

17 The Contractor shall coordinate and field-verify the electrical rough-ins provided for their use by the Electrical Contractor.

18 The Contractor shall exercise care during installation. Damage to cables or equipment will not be accepted. Damaged cable or equipment must be replaced.

19 The Contractor shall remove and replace cabling that is found to have been stretched or pulled past the recommended pulling tension during installation.

20 The Contractor shall 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.

21 The Contractor shall be responsible for coordination with Owner's staff the software configuration options of software configurable systems.

22 The Contractor shall provide, the Owner, installable and exact copies of all software used by or running on any system installed.

23 The Contractor shall provide to the Owner keys for all lockable equipment installed.

24 The Contractor shall provide all passwords for any system or equipment that may use or be locked with a password.

25 **Th**e Contractor shall provide to the owner a completed warranty card with filled in information for every installed device where the original manufacture provides a product warranty over and above the Contactor's required warranty.

B. Procedures & Methods

01 The Contractor shall 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.

02 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.

03 Equipment shall be mounted into racks and consoles, and fully wired and tested, before delivery to job site.

04 Equipment and enclosures shall be mounted plumb and square in relation to the structure.

05 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.

06 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

01 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.

02 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.

03 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

04 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.

05 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.

06 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.

07 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.

08 Cabling shall be placed in conduit where exposed in gym roof joist. Exposed cables shall not be allowed.

D. Equipment and Cable Labels:

01 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 as-built drawings.

02 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.

03 Marking codes used on cables shall correspond and be shown clearly on as-built drawings.

04 Provide all proposed wording and / or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.

05 All wall plates shall be labeled with Input and Output identifications and referenced to corresponding operational software or hardware it serves.

06 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 As-Built 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 As-Built drawings as device and equipment cross-reference identifier and servicing aids.

E. Connections and Connectors

01 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.

02 RF cable connectors shall be made with hex crimp.

03 Cables shall be terminated with the proper connector specifically produced for use with each type of cable.

04 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.

05 XLR type connectors shall be wired with pin 2 high, pin 3 low, and pin 1 shield.

06 Mechanical connectors must be specially made for type of cable or wire used.

07 Connector adapters will not be allowed in any part of the system.

08 Twist on connectors shall not be allowed.

09 Solder joints will be made with rosin-core solder.

F. Interconnection

01 Contractor shall make all system interconnections as necessary, as indicated on the Drawings, or specified herein.

02 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.

G. Cable Management

01 Cabling located above ceilings shall be tied off to and supported with cable hangers fastened directly to the structure.

02 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.

03 Holes in horizontal furniture surfaces for cable pass-through shall be provided with appropriate sized grommet. Grommet shall be black unless otherwise specified.

04 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:

a. Wall plate outlet box: minimum of ten (10) inches from wall surface to jack.

b. Termination panel: Six (6) inches behind termination panel from cable tie to jack

H. Equipment Racks

01 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.

02 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.

03 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.

04 Place all rack devices requiring adjustments, cleaning, or similar attention so that they will be accessible for such attention.

05 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.

06 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.

07 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.

08 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.

3.3 CONSTRUCTION

A. Required typical system mockups

01 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

01 The Contractor installing 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.

02 The Contractor installing any RF devices shall be aware that RF devices may cause interference to the equipment and take whatever precautions necessary to avoid causing interference.

3.4 PROTECTION AND CLEANING

A. Equipment

01 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.

02 Cover installed equipment racks for protection during high dust periods.

03 Do not operate equipment with fans during high dust periods of the installation.

04 Coil and protect cabling from damage prior to termination to equipment

B. Prior to system turnover to Owner:

01 Remove all dirt and debris from equipment racks and equipment rooms.

02 Clean all equipment filters, vents, and fans.

03 Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

3.5 CLOSE OUT & QUALITY CONTROL

A. The Contractor will not receive written acceptance of work and materials until the Contractor provides written release of lien to the Owner.

B. The following should be complete and in place before final system inspection & demonstration is scheduled and performed with the Owner’s Consultant:

01 Provide written detailed substantial completion reports of system testing

02 Dust, debris, solder splatter, etc. is removed

03 Cables are dressed, routed, and labeled with heat-shrink tubing over label at ends.

04 Connections are confirmed consistent with regard to polarity

05 Equipment operation tested and operating normally

06 Equipment software is installed and configured

07 Electronic devices are properly grounded

08 Devices requiring AC Power are Powered and from the proper circuit

09 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.

C. TESTING & ADJUSTING

01 The Contractor will be responsible for adjusting the installed system and notifying the Consultant when system adjustments have been completed:

a. In accordance with Construction Documents

b. As required, to provide the Owner a fully functional system at system turnover

c. As directed by the Consultant

02 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:

1) Flat from 60 Hz to 2 kHz + or – 1-1/2db with a 1db per 1/3 octave roll off after 2K

2) 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 As-Built Project Manual

03 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.

3.6 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:

01 Demonstration of all system operations to the Consultant as the Owner’s representative.

02 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.

03 The technicians shall be equipped to perform necessary corrections to the system. They Contractor shall provide test equipment capable of testing any and all parts of the equipment, cabling, or systems.

04 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

05 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

06 During the final acceptance walkthrough, the Contractor shall demonstrate operation of each major component and functional requirement as specified herein.

07 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.

08 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.

3.7 TRAINING

A. Reference 270010 Closeout Requirements.

B. Training Requirements

01 Owner Training of the completed installation is an important part of the overall success of this project and therefor the installing Contractor shall provide comprehensive system training to the Owner as defined below and with the minimum training hours as specified.

02 Prior to scheduling or delivering Owner Training confirm the following:

a. System as-built 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.

03 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

04 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 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.

f. 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.

g. 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.

h. 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.

05 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 Service and maintenance requirements

06 The Owner reserves the right to establish training times, duration, and topics.

3.8 WARRANTY

A. Reference 270010 Closeout Requirements.

B. The Contractor shall provide to the Owner a manufacturer's warranty certificate for all installed equipment.

3.9 CLOSEOUT DOCUMENTATION

A. Reference 270010 Closeout Requirements.

END OF SECTION 27 41 00

SECTION 27 41 50 - LOCAL SOUND SYSTEMS

PART 1 - GENERAL

1.1 SCOPE-OF-WORK SUMMARY

A. Unless noted otherwise, the term “Contractor” or “Proposer” used herein refers to the respondent of this RFP.

01 Described herein this Section is the scope-of-work requirements, criteria, and equipment necessary for the successful Proposer to furnish and install in the Local Sound Systems, hereafter referred to as (LSS) which shall include the following subsystems:

a. Gym/Cafeteria

b. Music Rooms

c. Portable Equipment Carts

02 More fully described:

a. By the schematic diagrams found in the Construction Document Package.

b. This is all new installation no existing equipment intended to be reused

B. The work performed shall be of professional quality and installed in an expected manner as would typically be delivered by professional Audio & Video Contractors regularly in the primary business of installation of equivalent systems.

C. The Proposer shall furnish their lump sum price offer to provide a turn-key package in response to the Audio & Video specific work found in the Construction Documents and specifically for the work contained herein.

D. This document is intended to provide all hopeful Vendor(s) / Contractor(s), hereafter referred to as the Proposer, with information it needs to submit a complete Turnkey solution and proposal for the District. The District will evaluate the submitted proposals to select a perceived Best Value Vendor to supply and install the Sound Reinforcement Systems for this project as described herein.

E. The successful Local Sound System (LSS) Proposer shall provide materials & labor to install new and reuse existing equipment as described herein and depicted in the construction drawings.

F. The District shall accept proposals from both manufacturers and authorized resellers of products and systems specified herein and desires to have a competitive choice of local authorized reseller / manufacturers to find the best value for delivery of the systems.

G. The Successful Proposer’s responsibilities shall include but are not limited to the following:

01 Provide necessary services to integrate each component into a fully functional package with seamless functionality as described herein.

02 Install and make ready for use cabling and devices as described or depicted in the construction package necessary for a complete installation, along with accepted alternates.

03 Integrate into the construction any owner furnished and existing equipment and miscellaneous hardware as may be described herein or found in the site visit.

04 Maintain timely installations according to the project construction schedule.

05 Provide Owner system training, as-built documentation, and project manuals as

required by this construction package.

1.2 DEFINITIONS

A. General Construction common words, acronyms, and phrases found herein this specification and construction documents shall be as defined by and in accordance with AIA Document A201, Fifteenth Edition, 1997.

B. Specific special use of common words, acronyms, and phrases found here in this document shall use the following definitions:

01 "Owner" shall refer to the building Owner.

02 "Successful Contractor" shall imply the Vendor or Contractor that is awarded the project scope of work described herein and enters into a written contract with the Owner or General Contractor to deliver said work.

03 "Proposer" shall mean Vendor, Contractor, or Subcontractor that submits a proposal to deliver the scope of work described herein this construction document package.

04 "Lump Sum" shall refer to a total amount to deliver full scope of work described inclusive of all materials and labor.

05 "Turn Key" shall refer to all work required to provide the full scope of work described inclusive of all materials and labor and deliver to the Owner a fully functional system.

06 "LSS" shall be an acronym for "Local Sound System".

1.3 RELATED DIVISIONS, SECTIONS, AND DOCUMENTS

A. References to the following related documents do not limit or release the Contractor from the responsibility of having the necessary knowledge of other non-referenced related documents that makeup the Construction Document Package.

B. The following Contract Documents are hereby made a part of this Section:

01 Division 1 Documents found in the Project Manual

02 Division 26 Documents that collectively make up the Construction Package including:

a. Section 26 05 00 – Common Work Results for Electrical

03 Division 27 Documents that collectively make up the Construction Package including:

a. Section 27 00 00 – General Communication Systems Requirements

b. Section 27 00 10 – Communications Systems Closeout Requirements

c. Section 27 05 26 – Grounding and Bonding for Communications Systems

d. Section 27 05 28 – Pathways for Communications Systems

e. Section 27 40 00 – AV/Multimedia General Requirements

f. Section 27 41 00 – Campus Multimedia Systems (CMS)

g. Section 27 41 50 – Local Sound Systems

h. Section 27 51 00 – Campus Communications Systems

04 Work diagrammatically shown or noted on project drawings

05 Other documents that collectively make up a part of this Construction

Document package.

1.4 RELATED WORK

A. References to the following specific related work does not limit or release the Contractor from the responsibility of coordination with other trades, or from having the necessary knowledge of other related work.

01 Work by the General Contractor

02 Work provided by Owner or Owner's Contractors

03 Work by Division 10 Subcontractors

a. Division 10 Gym Dividers

04 Work by other Division 27 Subcontractors

a. Division 27 Structured Cabling Subcontractor

b. Division 27 Campus Multimedia Systems Subcontractor

c. Division 27 Campus Communications Systems Subcontractor

05 Work by the Electrical Subcontractor

a. The Project Electrical Contractor will install electrical rough-in for use by the LSS Contractor and their devices. The LSS 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.

b. The LSS Contractor shall examine construction documents for familiarization of the provided Electrical Rough-in by the Electrical Contractor.

c. Needed Electrical back boxes, raceways, and pathways not provided by the Electrical Contractor, but needed for the LSS scope of work shall be the responsibility of the LSS Contractor unless noted to the contrary.

1.5 UNIT PRICES

A. The Proposer shall provide unit pricing breakdown for all equipment as a line item materials list submitted with their proposal. In the event the Proposal form does not specifically provide a worksheet for requested unit pricing, the Contractor shall provide the unit price list by separate attachment along with their Proposal.

B. The unit price may be used to add or deduct, by change order, quantities of units as represented by the unit price.

C. Failure to provide requested unit prices may result in the rejection of the proposal.

1.6 ALTERNATE & ALTERNATIVE PROPOSALS

A. Alternates

01 None.

B. Alternatives

01 The Proposing Contractor may provide an Alternative System Package that meets or exceeds the described system features and functionality.

a. Alternatives to systems described herein must be prior approved with

Owner & Consultant a minimum of 72 hours before bid date and time.

b. The Owner and Consultant reserve the right to make final determination for acceptance of Contractor's alternatives based on determination if proposed work or material is equal to that of the specified system requirements.

1.7 SUBMITTALS

A. Reference Section 27 40 00

PART 2 - PRODUCTS

2.1 GOVERNING WORK CLAUSES

A. General

01 All equipment furnished for this project shall be new and unused and shall be designed for the intended use and for uninterrupted duty cycle.

02 Exceptions to new equipment are the reuse of existing equipment as described.

03 Acceptance or implied approval of submitted products, product cut-sheets, or substitutions of equipment, equipment manufacturers, or system designs other than that specified herein does not relieve the Contractor of the responsibility to provide the functions and detail of the systems as found in the specified system.

04 The Contractor shall not receive final written acceptance of work and materials until the Contractor provides written release of any and all liens to the Owner.

2.2 ANCILLARY AND ACCESSORY ITEMS

01 The Proposer shall provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.

02 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.

03 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.

04 The Proposer shall receive no allowances because of omissions in work due to unfamiliarity or their misunderstanding of Proposal package documents.

B. Drawing Symbols

01 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.

02 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.

2.3 DOCUMENT DISCREPANCY

A. 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:

01 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.

B. Omissions

01 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.

2.4 THE (LSS) SYSTEM DESCRIPTION

A. Note: The following list is a general indication of the major components required in each space to be provided and installed by the Contractor. The Contractor shall not misinterpret this as a complete list of all components required. The schematic diagrams, details, and floor plans in the technology drawing set shall more clearly indicate the functional requirements of each space. Each space shall receive a turnkey system that meets all such functional requirements.

01 Gym/Cafeteria

a. Microphone and line input plates
b. Microphones and cables
c. Wireless microphone system
d. Speaker input plates
e. Digital signal processor with BYOD control
f. Wall touch screen controller
g. Assistive listening system
h. Power sequencing
i. Program loudspeakers
j. Wall mounted rack for housing equipment
k. Portable wireless microphone cart
l. Partition Sensor
m. Ground Bar

02 Music Room

a. Microphone and line input plates
b. Microphones and cables
c. Wireless microphone system
d. Digital Mixer for control
e. Power sequencing

f. Program powered loudspeakers

g. Portable equipment cart

B. Coordination with Others

01 27 41 50 Contractor: in each space, the audio system shall receive a Public Address (PA) feed from the 27 51 00 Campus Communications Systems Contractor.

02 27 41 50 Contractor: in several spaces (refer to schematics), the audio system shall receive a feed from the 27 41 00 CMS Contractor.

03 27 41 50 Contractor: in each space, the audio system shall receive a signal from the 28 31 00 Fire Alarm Contractor.

04 Electrical Contractor:

a. 27 41 50 Contractor shall coordinate with EC to ensure they have power where they need it and that the appropriate quantity and type of circuits are provided.

b. 27 41 50 Contractor shall coordinate with EC to ensure they have a connection to the network grounding backbone.

C. Mounting

01 All speakers shall be mounted such that they are acoustically decoupled from the structure to avoid vibrations.

02 Specific mounting requirements shall be determined by the speaker and location. Contractor shall submit drawings indicating how they intend to mount each speaker. Submittals must be reviewed by Consultant prior to installing any speaker mounts.

D. Cooling

01 Contractor shall provide appropriate fans and thermostatic control for each audio system rack

E. Power

01 Electrical Contractor shall provide as a minimum the following quantity and type of circuits for sound system racks

a. Stage:

1) Two (2) dedicated 120V, 20A circuits at stage sound rack cutout.

b. Music Rooms

1) One (1) 120V, 20A receptacle on the teacher’s workstation circuit for mixer cart at teacher’s station.

2) One (1) dedicated 120V, 20A circuit for wall mounted powered speakers.

02 Contractor shall configure each sound system for AC power up and down activation from the control rack/cart using a key switch system. Key switch system shall include the following options:

a. Admin PA system only

b. Local sound system only (no “Admin PA”)

c. All systems live

2.5 MANUFACTURERS

A. Governing Clauses

01 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. 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. The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specified system standards.

02 If the proposed system does not meet all of the following 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. 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.

03 Reference to a manufacturer that may appear in this specification is not intended to imply that all products available from said manufacturer meet in full all requirements of this specification. The Proposing Vendor shall be responsible for full compliance or the specification requirements.

2.6 EQUIPMENT

A. Governing Clauses

01 The following sets forth the minimum LSS 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.

02 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 Contractor’s proposal.

03 Additionally, to exceptions, the Proposer shall list clearly any value added features and or functions their proposed equipment may offers over and above the stated minimums.

04 LSS equipment provided and installed shall be as depicted or shown on the construction drawings, schematic diagrams, or described herein this document.

05 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.”

06 The Contractor shall be solely responsible for all equipment needed for a turn-key project based on their lump sum proposal and the construction document’s descriptive requirements.

07 All Equipment and Systems as depicted on the project Construction Drawings.

08 All System features and functions as described herein this document.

09 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.

2.7 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 270010 Closeout Requirements and drawing details for spare equipment requirements.

B. The contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion as attic stock. No devices shall be used without documentation and written authorization from the Owner's representative.

C. Unused items shall be turned over to the owner within thirty (30) days of substantial completion of the project. Unused material is to be ordered separately when commissioning is scheduled in order to ensure the longest warranty period possible.

D. Contractor shall obtain a signed transmittal of equipment turned over to the owner at the end of the project. The signed transmittal shall be included in the contractor's closeout documents.

2.8 ALTERNATES

A. Alternates shall be identified clearly on the proposal with the associated Alternate number as listed in these documents. State clearly if the alternate is an Additive or Deductive price to the base bid lump sum amount.

PART 3 - EXECUTION

3.1 CONTRACTOR REQUIREMENTS AND RESPONSIBILITIES

A. General

01 The Contractor shall provide, furnish, deliver, transport, erect, install, configure, and connect completely all of the material and equipment described herein or depicted on any Proposal package construction document or Drawing. 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.

02 The Contractor shall consider this a "Turnkey Project" for use by the Owner.

03 The Contractor shall coordinate with all other trades to avoid causing delays in the installation schedule.

04 In the event of any conflicts, delays or improper preparatory work by other trades, notify the General Contractor, Consultant and Owner.

05 Equipment and enclosures shall be mounted plumb and square in relation to the structure.

06 Provide cut-in boxes or approved clamping rings where back boxes are required but not provided by Electrical Contractor.

a. All low voltage cabling shall be installed in raceway. Cut-ins shall only be allowed where specifically indicated on the drawings or with prior written approval.

07 The Contractor shall coordinate their requirements for proper ground system to all equipment.

08 Coordinate and verify with the Electrical Contractor, the installation of needed cable raceways.

09 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 will not be accepted as fasteners.

10 The Contractor will 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 will be noted or coordinated in writing with the General Contractor.

11 The Contractor cannot shoot, fasten, or screw hangers to the roof deck. Any exceptions will be noted or coordinated in writing with the General Contractor.

12 The Contractor will 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.

13 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.

14 Equipment shall be fabricated with equipment mounted into racks, enclosures, and consoles and be fully wired and tested, before delivery to job site.

15 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.

16 The Contractor's construction, fabrication, installation, or delivery of materials must comply with applicable standards and practices.

17 The Contractor shall coordinate and field-verify the electrical rough-ins provided for their use by the Electrical Contractor.

18 The Contractor shall exercise care during installation. Damage to cables or equipment will not be accepted. Damaged cable or equipment must be replaced.

19 The Contractor shall remove and replace cabling that is found to have been stretched or pulled past the recommended pulling tension during installation.

20 The Contractor shall 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.

21 The Contractor will be responsible for coordination with Owner's staff the software configuration options of software configurable systems.

22 The Contractor shall provide, the Owner, installable and exact copies of all software used by or running on any system installed.

23 The Contractor will provide to the Owner keys for all lockable equipment installed.

24 The Contractor will provide all passwords for any system or equipment that may use or be locked with a password.

25 The Contractor shall provide to the owner a completed warranty card with filled in information for every installed device where the original manufacture provides a product warranty over and above the Contactor's required warranty.

B. Audio System Specific Requirements and Techniques

01 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.

02 Provide shaft locks or security covers, as required by the Consultant, on non-user operated equipment having front panel controls. Install at the conclusion of

Acceptance Testing.

03 Install XLR type connector wired pin 2 high, pin 3 low, and pin 1 shield.

04 Loud-speaker suspension

05 Speakers shall be suspended in a safe, secure and permanent manner.

06 Provide a secondary safety cables for enclosures weighing over 25 lb.

07 Special Audio Techniques

a. The Contractor shall float cable shields at the output of source devices for line level and audio signals and connect it at inputs.

b. In the installation of equipment and cables, consideration shall be given not only to operation efficiency but also to overall aesthetic factors.

c. Coordination of personnel and subcontractors associated with any part of construction, delivery, installation or testing.

d. Tests and adjustments, written reports, system demonstration to Owner or Owner's agent and final system as-built documentation.

C. Audio System Adjusting

01 Prior to energizing or testing the system, ensure the following:

a. All products are installed in a proper and safe manner per the manufacturer's instructions.

b. Dust, debris, solder, splatter, etc., is removed.

c. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

d. All products are neat, clean and unmarred and parts securely attached.

e. Electronic devices re properly grounded.

02 Prior to energizing the system, perform the following tests in compliance with applicable EIA standards. Record the results of each test in the Project Record Manual.

a. Test each AC power receptacle with a circuit checker for proper hot, neutral and ground connections.

b. 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 the results of these tests, include the calculated impedance based on number of units on a line and the size and distance of the run. Correct any field readings that differ more than 20% from the calculated impedance.

03 Speaker Polarity Verification Test

a. Use an electronic polarity checker to test each reinforcement speaker. All speakers should have the same relative polarity.

04 Remote Input Verification Test

a. Using a microphone or portable signal generator, connect to each microphone receptacle throughout the facility.

b. Verify that the receptacle under test appears at the correct position on the microphone mixer and is operating properly.

c. In a similar manner, check all remote line inputs for correct wiring and labeling.

05 System Equalization

a. Using a TEF 20, SYSID, or a spectrum analyzer with both 1/3 band and narrow band display, equalize all loudspeaker systems to provide a suitable frequency response as follows:

1) Flat from 45hz to 2khz with a 1db per 1/3 octave roll off.

b. Mark normal settings for each device and record settings in the Project Record Manual.

c. Verify system gain and amplifier levels.

d. When all the above tests have been completed and the system is ready for inspection, formally notify the Owner's Representative at least seven working days prior to inspection. Include in this notice copies of all data recorded, date each test was completed and the results of each test. All test data shall be available during the inspection process.

06 Test Equipment

a. Prior to start of testing, provide a list to the Owner's Representative of test equipment make, model numbers and calibration dates that will be used.

b. Furnish the following equipment as requested during final test verification by the Contractor and Owner's representative. The equipment is to be available for the entire test period through the final system testing.

c. Sound-Level Meter: ANSI S1.4-1971 Type S1A with digital or analog display. Meter to provide ranges of 40 to 120 dBA.

d. Pink Noise Source – Equal energy per octave bandwidth 20 HZ to 20,000 Hz, +- 2 dB per day.

e. Impedance Meter – Capable of testing audio lines at three frequencies, minimum, between 250 Hz and 4k Kz. Measurement Range: 1 ohm to 100 kohms.

f. Multimeter – Measurement range, DC to 20 k Hz, 100 mV to 300 V, 10 ma to 10 A.

g. Provide two portable VHF or UHF business band radios for use during acceptance testing with transmission range sufficient to cover project from any location. Have batteries charged and have a battery charger available. Radios to be available for duration of testing process, including any follow-up visits required.

3.2 EXAMINATION

A. The Contractor's responsibilities:

01 This is all new Construction.

02 The Contractor shall examine all related construction documents and ensure compliance to them.

03 The Contractor shall coordinate their installation schedule to comply with General Contractor's timeline.

04 The Contractor shall examine the project construction schedule against their need for sequences of completed spaces and coordinate those needs with the General Contractor. Example: MDF and IDF closets, etc.

05 The Contractor shall coordinate their work with other trades to facilitate a

seamless installation.

3.3 PROTECTION & CLEANING

A. Equipment

01 The Contractor shall coordinate with other trades to provide an acceptable environment for installed equipment. For example, provide a dust free environment for CD players, amplifiers, etc.

02 Cover installed equipment racks for protection during high dust periods.

03 Do not operate equipment with fans during high dust periods of the installation.

04 Coil and protect cabling from damage prior to termination to equipment

B. Prior to system turnover to Owner:

01 Remove all dirt and debris from equipment racks and equipment rooms.

02 Clean all equipment filters, vents, and fans.

03 Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

3.4 INSTALLATION & CONSTRUCTION

A. Procedures & Methods

01 The Contractor shall 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 self-fastened with screws. Adhesive is not an acceptable means to fasten any equipment.

02 All equipment installed within the equipment racks shall be fastened in an approved manner with serviceability in mind.

03 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 will also be used to support cable tie support bars for lacing cables to equipment.

04 All equipment mounting boards in head-end rooms, MDF's, electrical, or IDF closets shall be painted white or black as location dictates with fire retardant paint. The mounting boards shall be made of high-grade plywood.

05 Equipment shall be mounted into racks and consoles, and fully wired and tested, before delivery to job site.

06 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.

B. Wire and Cable Requirements

01 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.

02 All cables, regardless of length, shall be marked with indelible color-coded labels at each end. 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.

03 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.

04 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.

05 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.

06 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.

07 Cables between cable support bars and equipment shall have a minimum of 3” of sag between the bar and connector and be consistent with other cables installed in the rack.

08 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.

09 Equipment and Cable Labels:

a. Provide all proposed wording and/or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.

b. All labels used must be permanent and secure. Provide labeling as follows unless otherwise noted in a specific section:

1) 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 As-Built drawings for equipment identification.

2) 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.

3) Labels shall be uniform in size.

4) 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.

5) Provide engraved Lamacoid labels on each equipment rack rear door or console rear panel reading "No user serviceable parts. Refer service to qualified technician."

6) All label lettering shall be a minimum of .08" high.

7) Embossed adhesive labels are not acceptable.

8) 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.

9) 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.

10) All wall plates shall have input and output connectors labeled in a professional and permanent manner, no hand written labels will be accepted.

11) Cable and Jack labels shall include room identification with unique cable number, jack location within the room, and MDF or IDF number.

12) 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.

13) Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked in a manner approved by the Consultant.

14) 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.

15) All labeling information shall appear on the As-Built drawings.

10 Service Loops

a. Provide ample service loops at each termination so that plates, panels, and equipment can be removed for service, re-termination or inspection. Provide the following as a minimum:

1) Wall plate outlet box: minimum of ten (10) inches from wall surface to jack.

2) Termination panel: Six (6) inches behind termination panel from cable tie to jack.

11 Connections and Connectors

a. Connections shall be made with approved connectors on cables, terminal blocks, or punch blocks. Crimp style connectors shall be made with proper crimping tool.

b. Cables will be terminated with the proper connector specifically produced for use with each type of cable.

c. Connector adapters will not be allowed in any part of the system.

d. RF cable connectors shall be made with hex crimp.

e. Two point crimps will not be accepted.

f. Solder joints will be made with rosin-core solder.

g. Mechanical connectors must be specially made for type of cable or wire used.

h. Twist on connectors will not be allowed.

3.5 CLOSE-OUT QUALITY CONTROL

A. The following should be complete and in place before final system inspection & demonstration is scheduled and performed with Owner's Consultant:

01 Contractor has provided substantial completion report to Consultant.

02 All equipment shall be operating normally.

03 All equipment software is installed and configured.

04 All electronic devices are properly grounded.

05 All powered devices have AC power from the proper circuit.

06 All patch cables and jumpers are in place.

07 Insulation and shrink tubing are present on cable ends.

08 Equipment labels are in place.

09 The system documentation is complete with "as- built" drawings available.

10 Dust, debris, solder splatter, etc. is removed.

11 All cables are dressed, routed, and labeled; all connections are consistent with regard to polarity.

12 To the best of the Contractor's knowledge, all contractual system specifications are fully met, in detail and intent.

B. Contractor Testing prior to Consultant proof-of-performance inspection

01 The installing Contractor shall test the systems prior to Consultant proof-of-performance inspection.

02 The contractor shall create a system checklist.

a. Each component of a system will be checked for completeness and signed off on by the project foreman and CTS-D

b. Checklist must be completed and sent to the consultant no less than 72 business hours prior to the inspection.

C. System Documentation

01 Prior to final acceptance by Owner, all system closeout documentation must be delivered and made available during final acceptance walkthrough.

a. As-Built Drawings

b. Equipment Manuals

02 All documentation requirements stated in the Submittal requirements will be updated and made a part of the As-built documents.

D. Testing & Adjusting

01 The Contractor will be responsible for adjusting the installed system and notifying the Consultant when system adjustments have been completed:

a. In accordance with Construction Documents

b. As required, to provide the Owner a fully functional system at system turnover as directed by the Consultant

E. Final Acceptance Testing Verification

01 Acceptance Testing will be the responsibility of and performed by the Contractor in the presence of the Consultant and other Owner's representatives. Coordinate this testing so that free access, work lighting, and electricity are available on the site.

02 Fully balance all audio systems as directed by the consultant. This also means

that all room amplifiers will be set for equal audio level in the room with equal audio input.

03 The Contractor must complete all previous punch-list items prior to final acceptance test verification by the Owner and Consultant.

3.6 DEMONSTRATION

A. The Contractor will be responsible for the following:

01 The Contractor shall demonstrate all systems to the owner and Owner's representatives. This demonstration shall occur after all the submittal documents are supplied, including As-Built drawings, substantial completion report, and test results, and after notifying the Consultant in writing that the system meets the specification and is complete and ready for verification.

02 Demonstrate operation of each major component and functional requirement as specified herein. If any portion of the system does not appear to be functioning properly, further test, along with corrective actions shall be performed by the Contractor. If the need for further adjustments becomes evident during the demonstration and testing, the demonstration shall be discontinued until the system operates properly.

03 The Contractor shall remain responsible for all equipment, labor, hardware and documentation, in part and in total, until the Owner accepts such work or material in writing.

04 The Contractor shall be responsible for equipment adjustments to ensure normal and proper operation. The Owner required system adjustments will be made by the Contractor as directed by Owner or Project Consultant during final testing.

05 Provide a minimum of two (2) installation technicians to assist the Owner or Project Consultant, as required during final test verification and final acceptance walkthrough. The technicians shall be equipped to perform necessary corrections to the system. They shall have test equipment capable of testing any and all parts of the equipment, cabling, or systems.

06 The technicians shall be prepared to make final adjustments as directed by the consultant. Equipment adjustments may be either electrical or physical.

07 The Contractor shall provide test equipment during final acceptance walkthrough. Minimum required test equipment shall include but not be limited to the following:

a. Multimeter for reading AC / DC voltage and continuity

b. Sound level dB meter

c. Audio signal tracer (powered speaker)

d. Portable video monitor

e. Tone and pink noise generator

f. Real Time Audio Analyzer (RTA)

g. An acoustic polarity pulsing phase tester

h. Three (3) two-way radios for communications between Contractor and Consultant.

3.7 OWNER'S TRAINING

A. Reference 270010 Closeout Requirements.

B. Training Requirements

01 Owner Training of the completed installation is an important part of the overall success of this project and therefor the installing Contractor shall provide comprehensive system training to the Owner as defined below and with the minimum training hours as specified.

02 Prior to scheduling or delivering Owner Training confirm the following:

a. System as-built 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.

03 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

04 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 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.

f. 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.

g. 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.

h. 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.

05 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 Service and maintenance requirements

06 The Owner reserves the right to establish training times, duration, and topics.

3.8 WARRANTY

A. Reference 270010 Closeout Requirements.

B. The Contractor shall provide to the Owner a manufacturer’s warranty certificate for all installed equipment.

3.9 CLOSEOUT DOCUMENTATION

A. Reference 270010 Closeout Requirements.

END OF SECTION 27 41 50

SECTION 27 51 00 - CAMPUS COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE-OF-WORK SUMMARY

A. Unless otherwise noted, the terms “Contractor”, “Offeror”, and “Proposer” are used interchangeably herein and refers to the respondent submitting a proposal for this RFP Section of Work.

B. The Proposer Shall:

01 Provide Equipment, Cable, and Devices described herein or depicted in the construction drawings.

02 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.

03 Integrate into the construction any existing or owner furnished equipment and miscellaneous hardware as may be described herein.

04 Maintain timely installations according to the project construction schedule.

05 Provide Owner Training, As-Built documentation, and operations manuals.

C. Collectively the Campus Communications Systems (CCS) Contractor delivered systems shall be as described herein and depicted in the construction drawings and provide for the following:

01 Campus wide Public Address Communications System, with centralized master clock system and audio alert notification (bell) system as follows:

02 Minimum of Thirteen (13) Independent Hall audio channels (zones)

a. Zone 1 Staff Rooms

1) Admin

2) Offices

3) Conference Rooms

4) Workrooms/Workspaces

5) Staff Lounges

6) Storage Rooms

7) Mechanical Rooms

8) Electrical Rooms

9) IT Closets

b. Zone 2 Classrooms

1) Each classroom shall be individually addressable or by zone.

c. Zone 3 Library

d. Zone 4 Cafeteria-Kitchen

e. Zone 5 Gymnasium-Athletics

f. Zone 6 Hallways-Corridors-Restrooms

g. Zone 7 Portable Buildings (Spare)

h. Zone 8 Outside Speakers

1) Independent audio for each audio zone North, East, South, and West.

03 IP based Web-Browser Graphical User Interface, IP Bell / Audio event scheduler, with 365 day Event Scheduling Calendar.

1.2 RELATED DOCUMENTS

A. References to the following related documents do not limit or release the Contractor from the responsibility of having the necessary knowledge of other non-referenced related documents that makeup the Construction Document Package.

B. The following Contract Documents are hereby made a part of this Section:

01 AIA Document A201, Fifteenth Edition, 1997

02 Division 1 Documents found in the Project Manual

03 Division 27 documents that collectively make up the Construction Package including:

a. Section 27 00 00 General Technology Requirements

b. Section 27 10 00 Structured Cabling Infrastructure

c. Section 27 40 00 AV-Multimedia General Requirements

04 Work diagrammatically shown or noted on project drawings

05 Other documents that collectively make up a part of this Construction Document package

1.3 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.

01 Work provided by Owner or Owner's Contractors

02 Work by Division 27 Subcontractors

a. Division 27 Structured Cabling Subcontractor

1) The project Structured Cabling Contractor shall provide horizontal and backbone cabling for connection to the CCS systems.

i. Data drops at head end equipment.

ii. Data drops from head end equipment to administrative desk phone locations.

iii. Backbone fiber between head end equipment.

03 Work by Electrical Subcontractor

a. The Project Electrical Contractor will install electrical rough-in for use by the (CCS) Contractor and their devices. The (CCS) 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

b. The (CCS) Contractor shall examine construction documents for familiarization of the provided Electrical Rough-in by the Electrical Contractor

c. Needed Electrical back boxes, raceways, and pathways not provided by the Electrical Contractor, but needed for the (CCS) scope of work shall be the responsibility of the (CCS) Contractor unless noted to the contrary

1.4 UNIT PRICES

A. The Proposer shall provide unit pricing breakdown for all equipment as a line item materials list submitted with their proposal. In the event the Proposal form does not specifically provide a worksheet for requested unit pricing, the Contractor shall provide the unit price list by separate attachment along with their Proposal.

B. The unit price may be used to add or deduct, by change order, quantities of units as represented by the unit price.

C. Failure to provide requested unit prices may result in the rejection of the proposal.

1.5 ALTERNATE & ALTERNATIVE PROPOSALS

A. Alternates

01 Not used

1.6 PERFORMANCE REQUIREMENTS & REFERENCES

A. Referenced standards and / or procedures will be binding on Contractor and all work will be judged against such standards and procedures unless otherwise stated in writing.

B. The Contractor shall be held responsible for and adhere to Manufacturers' installation recommendations and guidelines.

C. Other Reference Standards:

01 Audio Engineering Society (AES) Standards

02 BICSI/InfoComm International AVDRAM (AV Design Reference Manual)

03 ISO / ICS 33.160.01 through 33.160.99

PART 2 - PRODUCTS & SERVICES

2.1 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 turnkey 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

01 The Proposer shall provide ancillary and required accessory items necessary to furnish to the Owner a complete and fully functional system.

02 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.

03 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.

04 The Proposer shall receive no allowances because of omissions in work due to unfamiliarity or their misunderstanding of Proposal package.

G. Drawing Symbols

01 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.

02 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

01 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:

a. 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

01 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.

2.2 MANUFACTURERS

A. Governing Clauses

01 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.

02 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.

03 The Owner reserves the right to govern over and proclaim whether proposed products are equal to the specified system standards.

04 If the proposed system does not meet all of 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.

05 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.

06 Reference to specific equipment manufacturers does not imply that all products produced by that manufacturer meet the specification requirements.

B. Acceptable Manufacturers

01 Rauland

a. Telecenter U

2.3 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.

2.4 THE CAMPUS COMMUNICATION SYSTEM OR (CCS) SYSTEM DESCRIPTION

A. General

01 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

01 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.

02 The system shall provide independent communications paths to each occupied space excluding corridors and restrooms.

03 Corridor and common area loudspeakers shall be shared in a distributive topology and grouped in logical audio zones.

04 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.

05 A VOIP telephone system is provided by owner. The CCS shall be interfaced to the telephone system allowing any IP telephone location, with the entry of a password, to access the CCS, bells and clocks as well as initiate a page, call a specific room or zone, or initiate an emergency or time tone.

06 The system shall consist of:

a. Server Software

b. Campus Controller

c. IP Addressable Modules

1) IP Addressable Zone Paging Module

2) IP Addressable Aux. I/O Module

3) IP Classroom Module

d. IP Addressable Administrative Console

1) Quantity as indicated and located on the drawings.

e. IP Addressable Analog Gateway

f. Normal/Emergency Call Switch

1) Dual Level Call in Switch

g. Classroom and Command Area Zones

h. Power supply with battery back-up power

i. Audio Amplifiers for distributed loudspeaker system

1) Provide a dedicated amplifier for exterior zones.

2) Provide a dedicated amplifier for cafeteria, gym and stage.

j. Wall-mounted volume control for speakers at all offices, clinic, life skills classrooms, conference rooms, and additionally as indicated on the drawings.

k. Loudspeaker assemblies

l. Input from building LAN for connection to Owner’s IP phone system.

m. Wiring and all associated material, hardware, necessary for a fully operational system as described herein.

07 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.

b. All outside loudspeakers in a single zone shall have their cables run independently.

08 The system shall use standard audio path technology for common distribution and IP distribution to each remote zone.

09 The PA shall include UPS battery backup at each head end for emergency paging and a minimum of 30+ minutes of up operational time in the event of building power loss.

10 Local room wiring for speaker and call-in should be cabled with 18AWG stranded cable, 4 conductors (red, green, black & white), shielded, plenum, white outer jacket. Homeruns between headend shall be 25 pair Cat 5 plenum rated for

between closets and room zones shall use a minimum of 16AWG stranded twisted pair cable.

11 Common area loudspeaker zones shall have no more than 12 loudspeakers per homerun zone and be fed with a minimum of 16AWG stranded twisted pair cable.

a. Contractor will provide appropriate termination blocks for speaker level terminations. Common areas shall have a single zone feed

12 Additionally, the CCS shall provide the following special features:

a. Line Level Connectivity to each of the Local Sound Systems. The local sound systems for these spaces are provided by the 27 41 00 and 27 41 50 scope of work. The 27 51 00 Contractor shall connect to the balanced audio inputs and/or overrides provided on these systems.

2.5 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 form certain desired features and functions that the Contractor shall provide with their proposed system solution.

01 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.

02 Additionally, to exceptions, the Proposer shall list clearly any value added features and or functions their proposed equipment may offers over and above the stated minimums.

03 (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.

04 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

01 The Proposer shall provide along with their Proposal Bid Form Provide 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 item provided

b. Manufacturer of item

c. Model number of item

d. Description of item

e. Individual price of item

f. Extended price for quantity of items

g. Total of Proposal in the form of Lump Sum Amount

02 The Project Material / Equipment List shall be complete in detail and provided in excel spreadsheet file form and as a PDF document included and attached to the Proposal Form.

G. Contractor shall also furnish any ancillary equipment, devices, cables, connectors, and hardware necessary to provide a complete and functional system.

2.6 PROVIDE AND INSTALL:

A. Campus Communications System

01 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.

02 Acceptable Products:

a. Include products by the following manufactures:

1) Rauland Telecenter U

B. Uninterruptible Power Supply (UPS)

01 Provide uninterruptible power supplies with a “square wave” output as required to power the CCS 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.

02 Acceptable Products:

a. SMART2200TM2U

1) Or approved equal

2) Quantity as required

C. Loudspeakers

01 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 Contractor’s scope, refer to the loudspeaker schedule.

02 Acceptable products:

a. Refer to loudspeaker schedule in the technology detail sheets.

D. Remote Sound Console

01 Mixer

02 AM/FM Tuner w/ Antenna

03 CD Player

04 Push-to-Talk Desk Microphone

05 Refer to technology details for additional information.

E. Campus Clock System

01 Acceptable Products:

a. Include products by the following manufactures:

1) Sapling

02 Sapling SMA3000 Series Master Clock with wireless transmitter/repeater. Rack mount in CCS head end.

03 Provide single/double sided, 24V, 4” display, digital clocks at the locations indicated on the plans.

a. Single sided in all areas except hallways.

b. Double sided in all hallways with maximum spacing of 100ft between clocks.

c. Clock housing and display color to be selected by Owner/Arch.

d. Refer to clock details in the technology detail sheets.

04 Clocks shall be integrated into the CCS and accessible by the Owner provided VOIP phone system.

F. Provide speaker line surge protectors at both ends of all sound system wiring which exits the building. Edco Line Surge Protector, equal by Ditek, or approved equal.

2.7 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 270010 Closeout Requirements and drawing details for spare equipment requirements.

B. The contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion as attic stock. No devices shall be used without documentation and written authorization from the Owner’s representative.

C. Unused items shall be turned over to the owner within thirty (30) days of substantial completion of the project. Unused material is to be ordered separately when commissioning is scheduled in order to ensure the longest warranty period possible.

D. Contractor shall obtain a signed transmittal of equipment turned over to the owner at the end of the project. The signed transmittal shall be included in the contractor’s closeout documents.

2.8 ALTERNATES

A. Alternates shall be identified clearly on the proposal with the associated Alternate number as listed in these documents. State clearly if the alternate is an Additive or Deductive price to the base bid lump sum amount.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor's responsibilities

01 Examine all related construction documents to ensure compliance of them.

02 Examine and coordinate the installation schedule to comply with contracted timeline.

03 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.

04 Failure to make the required examinations shall not result in any additional charges to the Owner.

3.2 INSTALLATION

A. Requirements and Responsibilities

01 The Contractor shall furnish, deliver, transport, erect, install, configure, and connect completely all of 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.

02 The Contractor shall make this a “Turnkey Project” ready for the Owner’s use.

03 Coordinate with other trades working in the facility to provide seamless installation.

04 In the event of any conflicts, delays or improper preparatory work by other trades or existing conditions, notify the General Contractor, Consultant and Owner.

05 Provide cut-in boxes or approved clamping rings where back boxes are required but not provided by Electrical Contractor.

06 The Contractor shall coordinate their requirements for proper ground system to all equipment.

07 Coordinate and verify with the Electrical Contractor, the installation of needed cable raceways

08 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 with the General Contractor.

09 The Contractor shall not shoot, fasten, or screw hangers to the roof deck. Any exceptions shall be noted or coordinated in writing with the General Contractor.

10 The Contractor shall 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 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 The Contractor shall coordinate and field-verify the electrical rough-ins provided for their use by the Electrical Contractor.

16 The Contractor shall remove and replace cabling that is found to have been stretched or pulled past the recommended pulling tension during installation.

17 The Contractor shall 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 The Contractor shall provide to the Owner keys for all lockable equipment installed.

20 The Contractor shall provide all passwords for any system or equipment that may use or be locked with a password.

B. Procedures & Methods

01 Equipment shall be wall mounted, and fully wired and tested, before delivery to job site.

02 Equipment and enclosures shall be mounted plumb and square in relation to the structure.

03 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.

04 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

01 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.

02 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.

03 There shall be no unmarked cables at any place in any part of any system this includes both ends of the cables and patches.

04 Label markings codes used on cables shall correspond and be shown clearly on as built drawings

05 All cables shall be separated into like groups according to signal or power levels and routed separately to eliminate signal contamination and cross-talk.

06 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.

07 All cables will use Velcro wire wraps to manage and bundle cables. Velcro strips will be no more than a ¼" wide.

08 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.

09 Cabling shall be placed in conduit where exposed in gym roof joist. Exposed cables shall not be allowed.

D. Equipment and Cable Labels:

01 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 as-built drawings.

02 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.

03 Marking codes used on cables shall correspond and be shown clearly on as-built drawings.

04 Provide all proposed wording and / or numbering scheme for labeling to the Consultant for review and written approval prior to procurement or installation.

05 All wall plates shall be labeled with Input and Output identifications and referenced to corresponding operational software or hardware it serves.

06 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 As-Built 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 As-Built drawings as device and equipment cross-reference identifier and servicing aids.

E. Connections and Connectors

01 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.

02 RF cable connectors shall be made with hex crimp.

03 Cables shall be terminated with the proper connector specifically produced for use with each type of cable.

04 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.

05 XLR type connectors shall be wired with pin 2 high, pin 3 low, and pin 1 shield.

06 Mechanical connectors must be specially made for type of cable or wire used.

07 Connector adapters will not be allowed in any part of the system.

08 Twist on connectors shall not be allowed.

09 Solder joints will be made with rosin-core solder.

F. Interconnection

01 Contractor shall make all system interconnections as necessary, as indicated on the Drawings, or specified herein.

02 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.

G. Cable Management

01 Cabling located above ceilings shall be tied off to and supported with cable hangers fastened directly to the structure.

3.3 CONSTRUCTION

A. Required typical system mockups

01 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

01 The Contractor installing 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.

02 The Contractor installing any RF devices shall be aware that RF devices may cause interference to the equipment and take whatever precautions necessary to avoid causing interference.

3.4 PROTECTION & CLEANING

A. Equipment

01 The Contractor shall coordinate with other trades to provide an acceptable environment for installed equipment. For example, provide a dust free environment for CD players, amplifiers, etc.

02 Cover installed equipment racks for protection during high dust periods.

03 Do not operate equipment with fans during high dust periods of the installation.

04 Coil and protect cabling from damage prior to termination to equipment

B. Prior to system turnover to Owner:

01 Remove all dirt and debris from equipment racks and equipment rooms.

02 Clean all equipment filters, vents, and fans.

03 Clean all enclosures and back box interiors thoroughly before installing plates, panels, or covers.

3.5 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:

01 Provide written detailed substantial completion reports of system testing

02 Dust, debris, solder splatter, etc. is removed

03 Cables are dressed, routed, and labeled with heat-shrink tubing over label at ends

04 Connections are confirmed consistent with regard to polarity

05 Equipment operation tested and operating normally

06 Equipment software is installed and configured

07 Electronic devices are properly grounded

08 Devices requiring AC Power are Powered and from the proper circuit

09 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.

B. Contractor Testing prior to Consultant proof-of-performance inspection

01 The installing Contractor shall test the systems prior to Consultant proof-of-performance inspection.

02 The contractor shall create a system checklist.

a. Each component of a system will be checked for completeness and signed off on by the project foreman and CTS-D

b. Checklist must be completed and sent to the consultant no less than 72 business hours prior to the inspection.

C. System Documentation

01 Prior to final acceptance by Owner, all system closeout documentation must be delivered and made available during final acceptance walkthrough.

a. As-Built Drawings

b. Equipment Manuals

02 All documentation requirements stated in the Submittal requirements will be updated and made a part of the As-built documents.

D. Testing & Adjusting

01 The Contractor will be responsible for adjusting the installed system and notifying the Consultant when system adjustments have been completed:

a. In accordance with Construction Documents

b. As required, to provide the Owner a fully functional system at system turnover as directed by the Consultant

02 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:

1) Flat from 60 Hz to 2 kHz + or – 1-1/2db with a 1db per 1/3 octave roll off after 2K

2) 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 As-Built Project Manual

03 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.

E. Final Acceptance Testing Verification

01 Acceptance Testing will be the responsibility of and performed by the Contractor in the presence of the Consultant and other Owner's representatives. Coordinate this testing so that free access, work lighting, and electricity are available on the site.

02 Fully balance all audio systems as directed by the consultant. This also means that all room amplifiers will be set for equal audio level in the room with equal audio input.

03 The Contractor must complete all previous punch-list items prior to final acceptance test verification by the Owner and Consultant.

3.6 DEMONSTRATION

A. The final acceptance, with proof of performance and operational verifications for the installed Campus Communications 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:

01 Demonstration of all system operations to the Consultant as the Owner's representative.

02 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.

03 The technicians shall be equipped to perform necessary corrections to the system. They Contractor shall provide test equipment capable of testing any and all parts of the equipment, cabling, or systems.

04 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

05 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

06 During the final acceptance walkthrough, the Contractor shall demonstrate operation of each major component and functional requirement as specified herein.

07 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.

08 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.

3.7 OWNER'S TRAINING

A. Reference 270010 Closeout Requirements.

B. Training Requirements

01 Owner Training of the completed installation is an important part of the overall success of this project and therefor the installing Contractor shall provide comprehensive system training to the Owner as defined below and with the minimum training hours as specified.

02 Prior to scheduling or delivering Owner Training confirm the following:

a. System as-built 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.

03 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

04 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 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.

f. 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.

g. The third 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.

05 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

06 The Owner reserves the right to establish training times, duration, and topics.

3.8 WARRANTY

A. Reference 270010 Closeout Requirements.

B. The Contractor shall provide to the Owner a manufacturer's warranty certificate for all installed equipment.

3.9 CLOSEOUT DOCUMENTATION

A. Reference 270010 Closeout Requirements.

END OF SECTION 27 51 00

SECTION 28 00 10 - PHYSICAL SECURITY CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The Physical Security General Requirements as specified in Section 28, apply to the work specified in this Section.

PART 2 - MATERIALS AND METHODS

2.1 CLOSEOUT REQUIREMENTS

A. AS-BUILT DRAWINGS: 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.

B. CLOSEOUT MANUALS: At completion of job, furnish three copies of spare parts lists, operating instructions, product cutsheets, test results, manufacturer's studies/settings/reports and as-builts for all equipment furnished under this Division. These lists and instructions shall be published by the manufacturer of the equipment. Bind in 3-ring binders with project name. Provide a USB flash drive with a digital copy of complete closeout manual with each binder.

01 DOCUMENTATION:

a. Division 26:
   (i) Refer to Division 26 sections.

b. Division 27:
   (i) Refer to Division 27 sections.

c. Division 28:
   (i) Security System
      1. Owner's Operation Memo
      2. Complete device and equipment documentation.
      3. User manuals.
      4. Complete As-Built Wiring Diagrams
      5. Complete Security Device & Cabling Floor Plans
      6. Certification of system performance and operation as specified.
      7. Warranty Information
   (ii) Access Control System
      1. Owner's Operation Memo
      2. Complete device and equipment documentation.
      3. User manuals.
      4. Complete As-Built Wiring Diagrams
      5. Complete Access Control Device & Cabling Floor Plans
      6. Certification of system performance and operation as specified.

7. Warranty Information

(iii) Video Surveillance System

1. Owner's Operation Memo
2. Complete device and equipment documentation.
3. User manuals.
4. Complete As-Built Wiring Diagrams
5. Complete Video Surveillance Device & Cabling Floor Plans
6. Certification of system performance and operation as specified.
7. Owner's Signoff of Device Aiming
8. Warranty Information

(iv) Emergency Responder Radio

1. Owner's Operation Memo
2. Complete device and equipment documentation.
3. User manuals.
4. Complete As-Built Wiring Diagrams
5. Complete Device & Cabling Floor Plans
6. Building Signal Strength Survey
7. Certification of system performance and operation as specified.
8. Warranty Information

(v) Fire Alarm System

1. Owner's Operation Memo
2. Complete device and equipment documentation.
3. User manuals.
4. Complete As-Built Wiring Diagrams
5. Complete Fire Alarm Device & Cabling Floor Plans
6. Detector Sensitivity Settings
7. Certification of system performance and operation as specified.
8. Warranty Information

02 TRAINING SESSIONS:

a. Provide digital copy of training materials and each recorded training session with digital turnover documents.

03 TESTING:

a. 281300 – Security Device Testing Report
b. 281300 – Access Control Device Testing Report
c. 281600 – Video Surveillance Device Testing Report
d. 284600 – Fire Alarm Device Testing Report

04 SPARE PARTS:

a. Deliver all spare parts and loose items to the Owner at the end of the project. Provide a spare parts list and signed transmittal listing all items with closeout documentation.

05 WARRANTY:

a. Provide manufacturer's warranty information, including any extended warranties included in the project.
b. Provide warranty letter from each contractor and sub-contractor.
c. Provide copy of extended service contracts, if any, included in the project.

2.2 GUARANTEES, WARRANTIES, AND SERVICE CONTRACTS

A. GENERAL FOR PHYSICAL SECURITY SYSTEMS: 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.

B. DIVISION 26:

01 Refer to Division 26 sections for additional information.

C. DIVISION 27:

01 Refer to Division 27 sections for additional information.

D. DIVISION 28:

01 SECURITY SYSTEM

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.

02 ACCESS CONTROL SYSTEM

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.

03 VIDEO SURVEILLANCE SYSTEM

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.

04 EMERGENCY RESPONDER RADIO ANTENNA

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.

05 FIRE ALARM SYSTEM

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.

2.3 SPARE PARTS

A. GENERAL: 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. Include a spare parts list and signed transmittal with closeout documents.

B. Reference individual specification sections for additional information.

C. DIVISION 26:

01 Refer to Division 26 sections for additional information.

D. DIVISION 27:

01 Refer to Division 27 sections for additional information.

E. DIVISION 28:

01 SECURITY SYSTEM

a.	Wall Motion Sensors	Two (2)
b.	Ceiling Motion Sensors	Two (2)
c.	Ceiling Motion Sensors with Glass Break	Two (2)
d.	Glass Break Detectors	Five (5)
e.	Door Contacts	Three (3) of each type
f.	System Keys	Ten (10)

02 ACCESS CONTROL SYSTEM

a.	Card Readers	Two (2) of each type
b.	Video Intercom	None
c.	Video Intercom Master Station	None
d.	Door Contacts	Three (3) of each type
e.	Access Control Module	Two (2)
f.	Printable Cards	Fifty (50)
g.	System Keys	Ten (10)

03 VIDEO SURVEILLANCE SYSTEM

a.	Indoor Security Camera	Four (4)
b.	Exterior Fixed Security Camera	Four (4)

04 EMERGENCY RESPONDER RADIO ANTENNA

a.	System Keys	Ten (10)

05 FIRE ALARM SYSTEM

a.	Ceiling Smoke Detectors	Ten (10)
b.	Ceiling Heat Detectors	Three (3)
c.	Duct Detectors	Three (3)
d.	Pull Stations w/ Cover	Three (3)
e.	Monitor Module	Two (2)
f.	Control Module	Two (2)
g.	Ceiling Strobes	Three (3)
h.	Ceiling Speakers	Three (3)
i.	Ceiling Speaker/Strobes	Three (3)
j.	Wall Strobes	Three (3)
k.	Wall Speakers	Three (3)
l.	Wall Speaker/Strobes	Three (3)
m.	AHU Relays	Two (2)
n.	Wireguard – Wall Notification Device	Three (3)
o.	System Keys	Ten (10)

2.4 TRAINING

A. All training sessions for specific systems equipment (Security, Access Control, Video Surveillance, Fire Alarm, etc.) shall be recorded and the recordings be included in the closeout materials.

B. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans and closeout documentation.

C. DIVISION 26:

01 Refer to Division 26 sections for additional information.

D. DIVISION 27:

01 Refer to Division 27 sections for additional information.

E. DIVISION 28

01 SECURITY SYSTEM:

a. 8 Hours (2 hours to general staff and 6 hours to maintenance personnel)

02 ACCESS CONTROL SYSTEM:

a. 8 Hours (2 hours to general staff and 6 hours to maintenance personnel)

03 VIDEO SURVEILLANCE SYSTEM:

a. 8 Hours (2 hours to general staff and 6 hours to maintenance personnel)

04 EMERGENCY RESPONDER RADIO ANTENNA:

a. 6 Hours (2 hours to general staff and 4 hours to maintenance personnel)

05 FIRE ALARM SYSTEM:

a. 8 Hours (2 hours to general staff and 6 hours to maintenance personnel)

2.5 SCHEDULED WARRANTY ITEMS

A. After 10 months but no more than 11 months from Owner acceptance the contractor shall perform:

01 A warranty walk with the Owner, Owner's Representative, Architect, and Engineer and correct any identified items.

END OF SECTION 28 00 10

SECTION 27 41 00 - EMERGENCY RESPONDER RADIO ANTENNA SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Division 26 apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA, NFPA and ANSI Standards and be so labeled.

E. Provide Shop Drawings, Submittals and Closeout Documents per Section 26 00 00.

1.2 RELATED WORK

A. Section 26 00 00 – General Electrical Requirements

B. Section 26 00 10 – Electrical Systems Closeout Requirements

C. Section 26 05 00 – Common Work Results for Electrical

D. Section 28 10 00 – Physical Security General Requirements.

E. Section 28 31 00 – Fire Detection and Alarm System

1.3 SCOPE OF WORK

A. Division 26:

01 Furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to provide power and pathways for the ERRA system per the ERRA contractor's design. Requirements shall be in accordance with Division 26 00 00, Electrical.

B. Division 28:

01 Design, furnish, install, and test a complete and operating in-building Emergency Responder Radio Antenna System/Distributed Antenna System ['system' or 'DAS'] to provide complete coverage for the public safety agencies as required by the local fire department, other agencies and the authority having jurisdiction [AHJ]. The system will support only Emergency Responder and Public Safety Land Mobile Radios ['LMR']. The system shall not support District Radio, Cellular, and/or Wi-Fi Signals.

02 Locate ERRA head end in the building main data closet. Where necessary distributed power supplies may be located in telecom rooms with prior approval. Do not locate in other locations without prior written approval.

03 Monitor the ERRA system with the building fire alarm panel.

04 All equipment or devices requiring access for maintenance or testing shall be located in a manner to facilitate access in the future. Where items are installed above an accessible ceiling. Provide a label on the ceiling grid below identifying the system and device name as it appears on the as-built drawings and documents. Font size shall be legible from ground level below.

1.4 WORK INCLUDES

A. Provide all equipment, materials, labor, supervision and services necessary for or incidental to the installation of a complete Emergency Responder Radio Antenna System. The purpose is to extend and amplify the Emergency Responder and Public Safety Land Mobile Radio signals to a strength of 95% in all areas of the facility including elevators, stairwells and all floors.

B. It shall be the responsibility of the Emergency Responder Radio Antenna System contractor to obtain all required permits, approvals and certifications from the authorities having jurisdiction.

C. All fees associated with the licensing shall be paid by the Contractor.

D. Testing of the system shall conform to the testing requirements as described in the International Fire Code [IFC] Section 510.5.3.

E. All testing must be done on frequencies authorized by the FCC and in use by local agencies as directed by the Authority Having Jurisdiction [AHJ].

F. Final acceptance and approval shall be required from the local AHJ.

G. It shall be the responsibility of the Electrical Contractor to provide and install all conduit systems, standard electrical boxes, and operating power for the building access systems as outlined on the project drawings. This Contractor shall coordinate all system requirements with and provide special back boxes to the Electrical Contractor prior to installation of conduit.

H. The Electrical Contractor shall provide 120-volt power as required through separate dedicated branch circuits, maximum 20 amperes each. Each such circuit shall be labeled at the power distribution panel as EMERGENCY RESPONDER RADIO SYSTEM. The location of all circuit breakers serving the Emergency Responder Radio Coverage System shall be posted in the control unit cabinets. Each cabinet and all surge protection devices shall be grounded securely to the building grounding system.

01 Where the building has a standby generator, connect the ERRA system primary power source to a dedicated circuit fed from the generator.

02 Where an NEC Article 700 Life Safety power system exists, this branch of the generator power system shall be utilized.

I. Provide all testing, documentation, training, and warranty service contract as outlined in these specifications.

J. Section shall include:

01 Bi-Directional Amplifiers [BDA’s]

02 Distributed Antenna System

03 Coaxial Cables

04 Splitters and Directional Couplers

05 Battery Back-Up System

06 All other equipment and components necessary for a complete and functioning

Emergency Responder Radio Antenna System.

1.5 SYSTEM PRICING, PHASING AND BILLING

A. Proposed Contractor shall provide a proposal based on separate pricing for each of the following steps:

01 Step #1: Outdoor Testing of the Facility – This price shall include verifying the outdoor signal strength at the facility's location prior to beginning construction.

02 Step #2: Full Testing, in accordance with IFC Section 510 Grid Testing – This price shall include verification of signal strength throughout the entire facility.

03 Step #3: Emergency Responder Radio Antenna System Materials and Installation Pricing – This price shall include a full system design and installation, including costs for design, components, materials, labor, and testing. This price shall be a "Worst-Case Scenario" situation, as though the entire facility must require coverage.

B. The project must be budgeted as a complete set of processes, thus the reason for having all pricing, in a "Worst-Case Scenario" prior to performing any work. This pricing will provide a budget before the work begins.

C. The work will be made and billed in phases, in accordance with the three (3) afore mentioned steps.

01 Phase I billing shall be for step #1. Once step one is completed, results are to be provided to the General Contractor, Architect, and Engineer for review. Following this review, step two may be delayed, pending adjustment to the donor signal. If donor signal strength at the facility does not meet IFC Section 510 requirements, the AHJ must be consulted, prior to moving to step two. If the donor signal strength is adequate to meet IFC Section 510 requirements, authorization for step two will be given.

02 The Phase II billing shall be for step #2. Testing of the facility to determine signal strength status and to provide a base for a full system design. After testing, a final revised proposal for a full system design, installation and final testing shall be issued to the General Contractor for review. No further work is authorized until award of Phase III is granted.

03 Phase III billing shall be for step #3. Design, installation and final testing of the Emergency Responder Radio Antenna System. Provide design and final acceptance testing documents per Section 1.9 Submittals of this specification.

1.6 MANUFACTURERS

A. Subject to compliance with requirements, available integrators offering products that may be incorporated in the work include, but are not limited to:

01 **Honeywell**

02 **Notifier**

03 **Comba**

04 Other manufacturers allowed by the local authority having jurisdiction (AHJ) and approved by the Owner and Engineer.

1.7 CODES AND REGULATIONS

A. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are exceeded by the contract documents.

B. The equipment, materials, and installation shall confirm to the latest version of all applicable codes, standards and regulations of authorities having jurisdiction including the following:

01 NFPA 1 – The National Fire Code (including Annex O from 2009)

02 NFPA 70 – The National Electrical Code

03 NFPA 72 – National Fire Alarm Code

04 NFPA 1221 – Standard for the Installation, Maintenance and Use of Emergency Services Communication Systems

05 UL 2524 - 1st Edition In-building 2-Way Emergency Radio Communication Enhancement Systems

06 FCC 47 CFR Private Land Mobile Radio

07 FCC 47 90.219-2007 Services-Use of Signal Boosters

08 ICC 2009 International Fire Code, Code and Commentary

09 ADA “Americans with Disabilities Act”

10 FCC’s OET 65 Standards “Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields”

11 FCC Rules Part 22, Part 90, and Part 101

1.8 DEFINITIONS

A. Attenuation: The reduction in signal power, expressed in decibels, as a result of coupling, heat loss, or transmission distance in a cable or in air.

B. Bi-Directional Amplifier [BDA]: A device used to amplify band-selective or multi-band RF signals in the uplink, to the base station for enhanced signals and improved coverage. Also known as a signal booster.

C. Coupled Bonding Conductor [CBC]: a bonding conductor placed on the outside of any technology cable. Used to suppress transient noise.

D. Delivered Audio Quality Definitions [DAQ]: The universal standard often cited in system design, specifications, and testing reports for ERRA and DAS.

01 DAQ 1: Unusable, speech present but not intelligible.

02 DAQ 2: Understandable with considerable effort. Frequent repetition required due to noise and/or distortion.

03 DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise and/or distortion.

04 DAQ 3.5: Speech understandable with repetition only rarely required. Some noise and/or distortion

05 DAQ 4: Speech easily understood. Occasional noise and/or distortion.

06 DAQ 4.5: Speech easily understood. Infrequent noise and/or distortion.

07 Speech easily understood.

E. Distributed Antenna System [DAS]: A network of service antennas connected at intervals

along shielded coaxial transmission lines and all connected to head-end electronics amplifying the signals to be distributed. Often refers to a system that includes both the passive distribution system and the active amplifying electronics.

F. Directional Coupler: A component which directs a small portion of downstream RF energy to a port which can be connected to an antenna or another branch of distribution cabling, and also serves as a combiner of upstream energy between the tap port and through the connection port.

G. Donor Antenna: The antenna, usually mounted on the outside of a structure where a DAS is installed, which picks up signals over-the-air from a donor source.

H. Donor Source: The repeater, transceiver, cell site, or other radio site that produces signals which a DAS will relay and distribute.

I. Emergency Responder Radio Antenna System [ERRAS]: A two-way radio communication system installed to assure the effective operation and coverage of radio communications systems for fire, emergency medical services, and/or law enforcement agencies within a building or structure. The system is not designed for use with District LMR, Cellular Services, or Wi-Fi Services.

J. Federal Communications Commission [FCC]: federal agency responsible for implementing and enforcing America's communications laws and regulations.

K. OET 65 Standards: The FCC's Bulletin that provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

L. Public Safety and/or First Responder: agencies which are charged with the responsibility of responding to emergency situations. These include, but are not limited to, law enforcement, fire departments, and emergency medical services.

M. Reflected Power: Power which is reflected back along a transmission line as a result of discontinuities in line impedance caused at connectors or close proximity of metallic objects.

N. Radio Frequency [RF]: Energy from electromagnetic waves, or alternating currents that produce electromagnetic waves, in the spectrum of radio frequencies (30 kHz to 300GHz)

O. Signal Booster: See BDA

P. Splitter: A passive component that has a single input port and two or more output ports, effectively splitting the signal equally amongst the output ports. It also serves to combine upstream signals from the "output" ports into composite signals at the "input" port.

1.9 SUBMITTALS

A. Submittal procedures: See Section 26 00 00 and Paragraph 1.9 Submittals of this specification.

B. Submit a complete submittal package within 30 calendar days, for approval, after award of this work. Equipment is not to be ordered without approval. Partial submittals are not acceptable for review. Each submittal shall include a dated transmittal.

C. Submittal may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.

D. Quality Assurance Submittal:

01 Letter from manufacturer stating that the Contractor is an Authorized Factory Distributor for the area where the project is located.

02 The Contractor and Manufacturer shall supply sufficient information to indicate that the proposed system is based on the latest hardware, software technology and products comply with specified requirements and FCC Regulations.

03 The system described in the submittals shall be certified by an FCC Licensed Designer and installation shall be supervised by an FCC Licensed Project or Installation Manager.

E. Product Data Submittal including special boxes, cable and other material as requested by the Architect/Engineer including:

01 A cover sheet with the name and location of the project, the name, address and telephone number of the Contractor and the name, address and telephone number of the submitting sub-contractor. Include on or after the cover sheet sufficient space for review stamps.

02 Copies of FCC Licenses for both the Designer and Project or Installation Manger.

03 An indication of any deviations from Contract Document requirements, including variations and limitations. Show any revisions to equipment layout required by use of selected equipment.

04 A product data index and complete equipment list including for each product submitted for approval the manufacturers name and part number including options and selections.

05 Cut-sheets or catalog data illustrating the physical appearance, size, function, compatibility, standards compliance and other relevant characteristics of each product on the equipment list. Indicate by prominent notation (an arrow, circle or other means) on each sheet the exact product and options being submitted for approval.

06 Shop drawings showing proposed cable routing and device locations.

a. Clearly identify any areas of exposed conduit/wiring on the drawings.

b. Devices shall be identified by part number either on the drawings or in the symbol schedule.

07 Submit design data when the scope of work requires, including passband curves for both uplink and downlink for all bands, calculations, schematics, risers, sequences or other data.

08 Any resubmittal shall include a complete revised equipment list and any product data that is revised.

09 Any rejected submittals must be corrected and resubmitted to the AHJ and Architect/Engineers within 10 days of receipt of the rejected material.

F. Submit shop drawings locating all components of the system, indicating circuit routing, cable type, and gauge, and all items or components to be installed by other trades such as 120V power requirements. Shop or coordination drawings shall include information that will allow to the Contractor to coordinate interdisciplinary work and when necessary guide the manufacturer or fabricator in producing the product. Shop or coordination drawings shall be specifically prepared to illustrate the submitted portion of work, this may require diagrams, schedules, details, risers, floor plans and accurate to scale, (minimum of 1/8” = 1’-0”), equipment and device layouts prepared using a CAD or BIM engineering drawing program.

G. Testing

01 Submit all field test records of the radio systems. These shall include, but not be limited to:

a. Preconstruction Tests – Tests performed with the AHJ prior to construction of the new facility to verify that the municipality has signal coverage in that area.

b. Mid-Construction Tests – Tests performed with the AHJ during construction, once walls have been constructed and the exterior roof is installed.

c. Final Testing – Tests performed in conformance with IFC Section 510.5.3 and Section 510.6. This testing is to be signed off by the AHJ. Engineers shall also be present for the final testing process.

02 All testing records shall be submitted with O&M information and close out documents.

a. Provide one (1) digital copy of all close out documents

b. Provide three (3) copies of closeout documents bound in a 3-Ring binder with dividers and table of contents.

1.10 QUALIFICATIONS OF A PROPOSED CONTRACTOR

A. Proposed contractors who do not currently possess the necessary qualifications, trained and experienced personnel, financial capacity, and meet the other requirements herein described will be disqualified.

B. The proposed contractor, as a business entity, shall be an authorized distributor and designated representative of the emergency responder radio coverage system manufacturer, with full warranty privileges, and shall have been actively engaged in the business of selling, installing, and servicing emergency responder radio coverage systems for a period of at least 5 years.

C. Recently formed companies are acceptable only if specific pre-approval is requested, and granted by the Architect/ Engineer, based on experience of key personnel, current and completed projects, and all licensing requirements are met 10 working days prior to the contract proposal date.

D. The Contractor shall employ factory trained technicians capable of supporting the maintenance of the system. No contract employees are allowed unless they have been to the factory service school within the last 18 months. A certificate of this training shall be provided with the Contractors submittal.

E. The contractor shall employ full time local technicians and installers. The manufacturer shall maintain a full-time factory employed service staff for product support and service.

F. The proposed Contractor shall have an office within 150-miles of the job site, staffed with trained technicians who are qualified and licensed to supervise the installation, to be responsible that the system is installed as submitted, to conduct system start up and perform a 100 percent operational audit of all installed devices, to instruct the Owners representatives in the proper operation of the system, and to provide service throughout the warranty period.

G. All testing shall be conducted, documented and signed by a person in possession of an FCC General Radio Telephone Operators License and be a full-time employee of contractor.

H. The proposed contractor shall be fully experienced in the design and installation of the type of system herein specified and shall furnish with the contract proposal an itemized list of the installations of the type specified herein. The list shall include the name of the project, date of completion, the amount of the contract, the name, and telephone number of a qualified person to contact for reference. This list must contain at least two (2)

projects within a 150-mile radius of the school district to allow school administration officials to visit the job site for review of the system installation and service. Each reference project listed must utilize equipment by the same manufacturer as the proposed system.

I. The Proposed Contractor shall not have any grievances or complaints of record regarding workmanship, code compliance, or service response. A Proposed Contractor that has any prior finding(s) of a code or license violation or has any litigation in process concerning the installation of a system is unacceptable.

J. The ability of a proposed Contractor to obtain plans and provide a performance bond shall not be regarded as the sole qualification of the Contractors' competency and responsibility to meet the requirements and obligations of the contract.

K. The Builder shall be satisfied that a proposed Contractor meets all the requirements expressed herein before including the Contractor's proposal in the project.

L. The Owner may investigate, as they deem necessary to determine the ability of the proposed Contractor to perform the work. The proposed Contractor shall furnish to the Owner with any information or data requested for this purpose.

M. The Owner reserves the right to reject any contract proposal if the evidence submitted, or their investigation, fails to indicate that the Contractor is qualified to fulfill of any part of the contract or to complete the work contemplated therein.

N. The Owner reserves the right to reject the proposal of any Contractor who has previously failed to perform properly, or complete on time, contracts of a similar nature.

PART 2 - PRODUCTS

2.1 GENERAL

A. The system shall conform to the requirements as identified in IFC Section 510.4 and Section 510.5. Testing records are required to confirm performance of the system.

B. Compatibility: The equipment, including but not limited to repeaters, transmitters, receivers, signal boosters, cabling, fiber distributed antenna systems, etc., shall not interfere with the existing communication systems utilized by the Public Safety and First Responder agencies.

C. Power Supplies: At least two (2) independent and reliable power supplies shall be provided: one primary and one secondary. The primary power source shall be supplied from a dedicated 20-ampere branch circuit and comply with 4.4.1.4 of NFPA 72. The secondary power source shall be a dedicated battery back-up, capable of operating the in-building system for at least 24 hours at 100% operation. The battery system shall automatically charge in the presence of external power input. The battery system shall be contained in one NEMA 4 type enclosure. Monitoring the integrity of the power supplies shall be in accordance with 4.4.7.3 of NFPA 72.

01 Where the building has a standby generator, connect the ERRA system primary power source to a dedicated circuit fed from the generator.

02 Where an NEC Article 700 Life Safety power system exists, this branch of the generator power system shall be utilized.

D. Survivability

01 Fire Performance: All main risers or trunks of the antenna system shall be installed with resistance to attack from fire using one of the following methods:

02 A 2-hour fire rated cable or cable system

03 Routing the cable through a 2-hour fire rated enclosure(s) or shaft(s).

04 Cabinet: The signal booster and all associated equipment shall be housed in a single NEMA 4 certified, painted steel weather tight box. The cabinet shall be large enough to dissipate internal heat without venting from inside of the cabinet to outside atmosphere. Equipment installed on the roof of structures shall be rated for the expected extreme temperature and weather associated with rooftop installation.

E. Rooftop Installations shall require a Pitch Pocket for proper weather-tight roof penetrations.

F. Passive equipment: Passbands shall be VHF, UHF, and 700-900 MHz, IP rating of 2GHz.

2.2 SYSTEM COMPONENTS

A. Signal Strength

01 Downlink: A minimum signal strength of -95dBm shall be provided throughout the coverage area.

02 Uplink: Minimum signal strength of -95 dBm shall be received at the local municipality from the coverage area.

03 A donor antenna must maintain isolation from the distributed antenna system. The donor antenna signal level shall be a minimum of 15 dB above the distributed antenna system under all operating conditions.

B. Permissible Systems

01 Buildings and structures shall be equipped with an FCC Certified Class B Bi-Directional VHF, UHF, and 700-900 MHz amplifier(s) as needed.

02 The distributed antenna system may utilize a radiating cable, fixed antennas, or a combination of both.

C. Supported Frequencies: The system shall support VHF, UHF, and 700-900 MHz as required for local public safety and first responder bands as utilized by the local municipality.

D. Reject Filters: Notch filter sections shall be incorporated as necessary.

E. Band Migration Capability: The signal booster shall include re-tunable or replaceable filters to accommodate rapid and economic passband changes in the event of mandatory FCC changes with the NPSPAC band. The use of non-adjustable and non-replaceable RF input and output filters is prohibited.

F. Output Level Control: An automatic output leveling circuit shall be included for both passbands with a minimum dynamic range of 60 dB, less any gain reduction setting, to maintain FCC out of band and spurious emission compliance.

G. Degraded Performance in Emergencies: The system shall be designed to allow degraded performance in adverse conditions, such as abnormally high temperatures resulting from nearby fires, extreme voltage fluctuations and/or other abnormal conditions that may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e. under/over voltage, over/under current, over/under temperature, etc.) shall not be implemented as the standard mode for public safety applications.

H. Mode of Operation: The system shall be normally powered on and shall continuously provide passing of frequencies within the Public Safety and First Responder bands.

I. All in-building radio systems shall be compatible with both analog and digital communications simultaneously at the time of installation.

2.3 SYSTEM MONITORING

A. The distributed antenna system shall include connections to the fire alarm system to monitor the operational integrity of the signal booster, power supplies and annunciate malfunctions on the fire alarm system. Coordinate and provide this integration, as part of this system, with the fire alarm system contractor that is authorized to service the facility's fire alarm system. The integration of the DAS with the fire alarm system shall comply with Chapter 10 of NFPA 72.

B. A sign shall be located at the fire alarm panel with the name and telephone number of the local municipality indicating that they shall be notified of any failures that extend past the 2-hour time limit.

C. A dedicated supervised monitoring panel shall be provided within the emergency command center or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:

01 Normal AC power

02 Signal booster trouble

03 Antenna Failure

04 Loss of normal AC power

05 Failure of battery charger

06 Low battery capacity

2.4 CABLE ROUTING, INSTALLATION, AND SUPPORT

A. System wiring and equipment installation shall be in accordance with good engineering practices. Wiring shall meet all state and local electrical code requirements.

B. Wires and cables shall enter each equipment enclosure, console, cabinet or rack in such a manner that all doors or access panels can be opened and closed without removal or disruption of the cables.

C. Cable pathways, conduit, and cable support systems shall be complete with bushings, de-burred, cleaned, and secure prior to installation of cable.

D. Before energizing the system check all cables for correct connections and test for short circuits, ground faults, continuity, and insulation.

E. In all exposed areas such as mechanical rooms, parking garages, stairwells, etc., cable shall be fully enclosed in conduit. Exposed conduit/wiring in finished spaces shall be avoided whenever possible. Where exposed conduit/wiring is unavoidable it shall be clearly identified during the submittal phase.

F. Do not attach any supports to joist bridging or other lightweight members. The support system shall provide a protective pathway to eliminate stress that could damage the cabling.

G. Mount all equipment firmly in place such that vibration or jarring will not interfere with system operation. Route cable in a professional, neat, and orderly installation.

H. The cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.

I. Cable must not be fastened to electrical conduits, mechanical ductwork or piping, sprinkler pipes, or routed to obstruct access to hatches, doors, utility access panels, or service work areas. Do not route cables through fire doors, ventilation shafts, grates, or parallel for more than four-feet with line voltage electrical conductors. System cables shall not be run loose on ceiling grid or ceiling tiles.

J. Provide for adequate ventilation to all equipment housings and take precautions to prevent electromagnetic or electrostatic hum.

K. All conduit, duct, track, and raceway runs shall be spaced apart to allow for maintenance, such as the installation of couplings, without disturbing adjacent pathways.

L. Each cable run shall be free of splices. No terminations, splices, or equipment will be installed in or above ceilings.

M. Do not route any communication cable within two feet of any light fixture, HVAC unit, service access area, electric panel, or any device containing a motor or transformer.

N. System cable will not be installed in the same conduit, duct, or track with line voltage electrical cable.

O. Any pulling compounds utilized must be approved by the cable manufacturer and shall not degrade the strength or electrical characteristics of the cable.

PART 3 - EXECUTION

3.1 COORDINATION

A. Contractors shall coordinate with an FCC licensed engineering firm regularly employed in the business of designing and implementing Emergency Responder Radio Antenna Systems for emergency responders.

B. Electrical Work:

01 Proposed Contractor is required to provide for and coordinate with Electrical Contractor for any, and all required electrical work, including but not limited to, circuiting, conduits, back boxes, and more. The cost for all work by the Electrical Contractor shall be included in the submitted proposal for a complete and operable system.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to job site in OEM’s original unopened containers, clearly labeled with the OEM’s name and equipment model and serial identification numbers.

B. Store and protect equipment in a conditioned space until installation.

3.3 SYSTEMS INSTALLATION

A. Coaxial antenna cabling shall not be installed in the same conduit, raceway, or cable trays used for other systems.

B. All equipment shall be connected according to the OEM’s specifications to insure correct installation and system performance.

C. Coordinate all roof penetrations with General Contractor and/or Roofing Contractor.

3.4 GROUNDING

A. Ground cable shields and equipment per Manufacturer’s requirements.

B. Antenna mast shall be grounded per NFPA 70 NEC requirements and antenna manufacturer’s requirements. Provide grounding blocks and surge protection for outside coaxial cabling. Bond the antenna mast to the existing lightning protection system.

3.5 TESTING, WARRANTY SERVICE

A. A factory trained representative of the manufacturer shall supervise the final connections and testing of the system and it shall be subject to the final acceptance of the Architect/Engineer and Owner. All testing shall meet the testing standards set forth in IFC Section 510.

B. This contractor will thoroughly test all components of the systems and devices proposed herein to assure equipment specifications are met. This contractor will start up, test, and debug systems to ensure that all aspects of the system are working, documented, and reporting properly.

C. This Contractor shall make a thorough inspection and test of the complete installed Emergency Responder Radio Antenna System including all components and controls to ensure the following:

01 Complete and functional system.

02 Installed in accordance with manufacturer's instructions.

03 Verify proper operation and processing of signals.

04 Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

05 Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor’s expense.

D. A final System Acceptance Test shall be performed in the presence of a designated Owner representative and the AHJ. In the event that a system does not pass or only partially passes the Acceptance Test, the Project Manager will file a discrepancy report. Corrected items will be re-tested via a punch list to ensure that they comply with the system requirements.

E. This Contractor shall provide a warranty of the installed system against defects in material or workmanship for a period of one (1) year from the date of substantial completion. Any equipment, cabling or wiring shown to be defective shall be replaced, repaired, or adjusted free of charge. All labor and materials shall be provided at no expense to the Owner. All equipment will carry a one-year warranty or manufacturer's warranty whichever is greater.

F. Immediately prior to the end of the warranty period, the system shall be inspected and certified for the following year at no additional cost to the Owner.

3.6 DRAWINGS, MANUALS, AND TRAINING

A. As-built drawings and operating and maintenance manuals may be electronically transmitted in PDF file format (preferred) or paper copies may be provided in quantities indicated in Division 1. Paper copies shall be organized including index tabs in a 3-ring black binder of sufficient size.

B. Upon completion of the installation, and prior to final inspection, the Contractor shall furnish as-built drawings.

C. In addition, the contractor shall furnish complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets. Manuals shall include wiring diagrams to indicate internal wiring for each device and the interconnections between the items of equipment. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system. Provide a parts list with manufacturer and model number for commonly replaced parts. Include complete instructions for the inspection, testing, and maintenance of the system. Include copies of all calculation sheets used to configure the system.

D. Formal on-site training sessions shall be conducted by the Emergency Responder Radio Antenna System contractor. It shall be the responsibility of the Contractor to coordinate time and location of training sessions with the Owner. Provide documented general instruction as follows:

01 Provide instruction to the maintenance personnel to include the location, inspection, normal maintenance, testing, and operation of all system components. Provide a minimum of four (4) hours consisting of two 2-hour sessions separated by a minimum of two weeks.

02 Provide instruction to designated personnel on the functions and operation of the system provided including capabilities, limitations, and the meaning of status messages. State the proper procedure for testing, routine maintenance, and request for service. Provide detailed instruction on the operation of the system. Provide a minimum of four (4) hours consisting of two 2-hour sessions separated by a minimum of two weeks.

END OF SECTION 27 41 00

SECTION 28 10 00 - PHYSICAL SECURITY GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Refer to Section 27 00 00 for additional project scope information.

B. 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 systems and their sub systems.

C. Contractor shall be responsible for providing complete and functional systems as described in this specification and project drawings.

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. Contractor shall be, or Contractor shall provide, an Electrical Contractor for provision of high voltage power and conduits/raceway, where necessary.

F. Contractor shall be responsible for any and all related programming and end-user training unless noted otherwise.

1.2 RELATED WORK

A. Section 27 00 00 – General Technology Requirements

B. Section 27 10 00 – Communications Cabling General Requirements

C. Section 27 51 00 – Campus Communications Systems

D. Section 28 13 00 – Security and Access Control System

E. Section 28 16 00 – Video Surveillance System

1.3 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.4 QUALIFICATIONS

A. Training: Programmer shall have received manufacturer-provided and/or manufacturer approved training in the configuration of the physical security system(s) being provided.

B. Certification: Programmer shall hold the highest applicable manufacturer programming certification(s) offered by the manufacturer(s) of the physical security system(s).

C. The installing contractor shall be licensed by the State of Texas as a security services contractor.

D. Contractor Qualifications:

01 The installing contractor shall have been actively engaged in the business of selling, installing, and servicing security alarm systems for at least five (5) years.

02 The installing contractor shall provide 24-hour, 365-days per year emergency service.

a. Maximum of 2 hour response time during normal business hours.

b. Maximum of 4 hour response time during non-business hours.

03 Register through Texas School Safety Center.

04 Pay for all applicable permits.

E. Submittal: Certification certificate shall be submitted with physical security system(s) submittals.

1.5 PRE-CONSTRUCTION SUBMITTALS

A. 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:

01 Server(s) processor(s), disk space and memory size

02 Workstation(s) processor(s), disk space and memory size

03 Description of site (field) control equipment (Controllers/Field Panels) and their configuration

04 Operating System(s) Software, where software is provided or upgraded

05 Application Software, with Optional and Custom Software Modules supplied in this project

06 Integration Schemes: Proposed connectivity, software, development requirements, and SDK information, for inter-system communication.

07 Network reliability requirements

08 Number and location of LAN ports required

09 Number of IP addresses required.

10 Other specific network requirements, preferences, and constraints

11 Backup/archive system size and configuration

12 Start-up operations

13 Battery backup requirements

1.6 CLOSEOUT SUBMITTALS

A. 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.

01 Upon Owner approval, Contractor shall provide two (2) laminated copies and one (1) digital copy for each room/system type.

B. 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

2.1 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 0000.

2.2 REFER TO INDIVIDUAL SECTIONS.

PART 3 - EXECUTION

3.1 TRAINING

A. On-Site Training

01 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.

02 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 Department of Safety & Security approved processes.

c. Provide Security Systems Specialists approved recording of maintenance and troubleshooting process.

03 Training shall comprise two separate levels of training;

a. User Group upon substantial completion of the project.

1) User group training shall include a site/building walk through indicating locations of equipment and their usage.

2) User group training shall include the operation of workstation capability of system monitoring, command override and report generation.

b. Maintenance Group upon completion of the project prior to close out.

1) Maintenance group training shall include a site/building walk through indicating locations of equipment and their usage at up to six representative sites.

2) Review of a-build documentation at each controller location.

3) Troubleshooting techniques in hardware and software.

04 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.

05 Training shall include a “user’s manual” written for the school personnel on-site in

the operation of the system.

B. Duration: Refer to the individual sections for the minimum time requirements.

3.2 WARRANTY

A. 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 one year after final acceptance of the installation.

B. 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.

C. Purpose

01 The Contractor shall repair any system malfunction or installation deficiency discovered by the Owner or their representatives during the burn in and warranty period.

02 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.

3.3 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.

3.4 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.

C. Keys: Contractor shall turnover all keys, tagged and organized by type on individual key rings, to Owner upon project completion.

D. Refer to individual sections for spare parts requirements.

3.5 INSTALLATION REQUIREMENTS

A. Contractor shall furnish and install all cables, connectors, and equipment as shown on Drawings and as specified herein.

B. 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.

C. Beginning installation means Contractor accepts existing conditions.

D. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment shall include, but not be limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge, and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices that may move or wear in a manner to pose a hazard to the cable shall not be used.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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 duct entry and exit as well as to feed cable and operate pulling machinery.

J. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. 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.

K. 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.

L. Avoid abrasion and other damage to cables during installation.

M. 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. Lubricant shall not harden or become adhesive with age.

N. The cable system will be tested and documented upon completion of the installation as defined in the section below.

O. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit or surface mount raceway. Should it be found by the Consultant that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and Drawings with the respect or regard to the quality, amount of value of materials, appliances, or labor used in the work, it shall be rejected, removed, and replaced by the Contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be corrected at the Contractor's expense.

P. 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.

3.6 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.

3.7 COMMISSIONING SUBMITTALS

A. Provide the following to the Owner no later than 30 days prior to system commissioning/programming.

01 Commissioning Test Plan and Check-Off List: Specified elsewhere in this document.

02 Software: One set of fully functional software in manufacturer's original media packaging, temporarily licensed for a 30-day evaluation period.

03 Web-based Training: Access to web-based training modules.

3.8 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.

01 Submit documented test plan to Owner at least 14 days in advance of acceptance test, inspection, and check-off.

02 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.

03 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.

04 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.

3.9 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:

01 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.

02 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.

01 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.

02 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.

03 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.

01 Drawings shall include model number, serial number and installed location for major equipment including all CCTV cameras.

3.10 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).

3.11 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:

01 Bi-yearly inspections, preventative maintenance and testing of equipment and components in Year One of the warranty period.

02 Annual inspections, preventive maintenance, and testing of equipment and components in Years Two and above of the warranty period.

03 Regular Service, Emergency Service, and Call-Back Service

04 Labor and Repairs

05 Equipment, and Materials and transportation cost.

B. Response Time: Response time for service calls.

01 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.

02 Emergency service calls where controllers are not reporting shall be within 2 hours to the project site.

03 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

01 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.

02 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 28 10 00

SECTION 28 13 00 - SECURITY AND ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Refer to Sections 27 00 00 and 28 10 00 for additional project scope information.

B. This specification section covers the furnishing and installation of a new and complete enterprise- wide, low-voltage, Electronic Access Control System (EACS).

C. 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.

D. 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 Video Management System (VMS) Integration.

E. 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.

F. The security and access control system shall consist of all detection devices, control panels, security terminals (keypads), power supplies, notification appliances, signaling devices, zone expansion modules, equipment cabinets, water detection devices, proximity card readers and any auxiliary components installed, wired, or otherwise connected in accordance with the drawings, this specification and the manufacturer's specifications to function as intended. It is the intent of these specifications to provide an installation at each site which is complete in every respect. In the event that any additional details or special construction is required for the work intended, it shall be the responsibility of the contractor, whether mentioned herein or not. The drawings indicate approximate locations of some devices. Verify final location of devices with District prior to rough-in. The contractor shall be responsible for determining the final layout and exact placement of the system components to ensure coverage which fully satisfies the intent of these specifications and is at least as complete as that reflected on the drawings.

1.2 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.

1.3 RELATED WORK

A. Division 08 – Door Hardware

B. Division 11 – Parking Gates

C. Section 25 50 00 – Direct Digital Control System for HVAC

D. Section 25 95 10 – Sequence of Operations for HVAC Controls

E. Section 26 09 43 – Network Lighting Controls

F. Section 26 32 13 – Packaged Generator Assemblies

G. Section 26 36 23 – Automatic Transfer Switches

H. Section 27 00 00 – General Technology Requirements

I. Section 27 10 00 – Communications Cabling General Requirements

J. Section 27 15 00 – Communications Horizontal Cabling

K. Section 27 16 00 – Communications Connecting Cords

L. Section 28 10 00 – Physical Security General Requirements

M. Section 28 16 00 – Video Surveillance System

N. Section 28 31 00 – Fire Detection and Alarm

1.4 PROJECT SCOPE

A. New Cimarron ES:

01 Provide a new standalone security system for the new Cimarron ES per the drawings and these specifications.

02 The new building construction shall be phased including some devices installed in the site after the building completion.

1.5 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 and 28 10 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

PART 2 - PRODUCTS

2.1 GENERAL

A. Control panels and power supplies shall be housed within a locking metal cabinet, and keys shall be provided to the Owner.

B. Control panels shall be capable of communicating either in pulse dial or DTMF mode.

C. Batteries shall be sized for 4 hours on standby and 15 minutes in alarm.

D. Control panel(s) shall be earth grounded in strict accordance with the manufacturer's specifications and shall be provided with circuit protection from EMI and RF interference.

E. Control panels shall be equipped with devices intended to provide protection from the effects of transient voltages caused by lightning, in accordance with manufacturer's specifications.

F. Zone expansion modules and associated power supplies, relay modules, siren drivers and standby batteries shall be housed within a locking metal enclosure and placed where not susceptible to tampering.

G. Zone expansion modules shall support a minimum of eight fully programmable zones each and shall be listed as compatible to the control panel.

H. Motion detectors shall be equipped with a swivel bracket.

I. Keypads shall be a product of the control panel manufacturer and equipped with a

protective Lexan cover.

J. All proximity card readers shall be fully weatherized with operating temperatures of -31°F to 149°F and an operating humidity of 5-95% non-condensing Electronic Access Control Hardware

K. Homerun cabling to access control modules located in MDF/IDF where space, power and LAN connections have been reserved for security system use.

L. For each network drop, the structured cabling contractor shall provide a Cat 6 data cable back to the nearest MDF/IDF, including patch panels and patch cables at two ends. Data cable, jacks, patch panels, patch cords shall be the same products and manufacturers listed under the Network Cabling Section of this project.

M. Non-network security cabling shall be **ORANGE** and provided/installed under this specification.

N. Non-network access control cabling shall be **GRAY** and provided/installed under this specification.

O. Patch cords from outlet to security equipment shall be provided by Network Cabling Contractor and installed by the 28 13 00 contractor.

P. Fire alarm system shall dial out through the security system certified dialer. Coordinate with other trades for the required cable and connections.

2.2 SECURITY EQUIPMENT

A. Control Equipment

01 Bosch 9512G Master Panel

02 Bosch D928 Dual Phone Line Switcher

03 Bosch 1640 Transformer

04 Bosch B299 Addressable Expansion Module

05 Bosch D9127 POPIT Module

06 Bosch B930 LCD Keypad

07 Bosch B208 Expansion Module

B. Wireless Control Equipment

01 Wireless Door/Gate Release

a. Linear Access Wiegand Output Radio Reader Model WOR

1) Provide all modules and miscellaneous components required to integrate into the EACS.

C. Glassbreak detectors

01 GE Interlogix 5820A-W Recessed Shatterpro II

02 Bosch DS1101i

03 Bosch DS1108i

04 Or approved equal.

D. Motion Detectors

01 Directional Motion

a. Standard Range

1) Risco iWise RK825DTGL

2) Bosch ISC-CDL1-WA15G

b. Long Range

1) Risco iWise RK825DTGL

i. iWise RL17 Lens

2) Bosch ISC-PDL1-WA18G

c. 360 Degree Motion Low Ceiling (9-13ft)

1) Risco LuNAR DT RK150DTG3

d. 360 Degree Motion Extra High Ceiling

1) Bosch DS9370 (9-20ft)

2) Risco Industrial LuNAR DT RK200DTG3 (9-28ft)

E. Door Position Sensor

01 Recessed door applications:

a. GRI 180/184/8080/8484 Series matching installation.

b. GE 1078 Series

c. Color match to door frame for recessed applications.

02 Surface Mount

a. GRI 4400 Series Industrial Surface Mount

b. GE 2500 Series

c. GE 2505A-L Series for roof hatch applications.

03 Overhead Doors

a. GRI 200/200WG/250WG Series

b. GRI 4700 Series Track Mounted

c. GE 2200 Series

d. GE 2315 Series Track Mounted

04 Or approved equal.

F. Panic/Lockdown Buttons

01 USP-HUB2SA Hold-Up Button

a. Panic button located at reception area to alert GPISD police of campus event.

b. Install panic button on opposite side of knee space from door release buttons.

02 Or approved equal.

2.3 ACCESS CONTROL EQUIPMENT

A. Control Equipment

01 Bosch D901 Access Control Module

B. Proximity Card Readers

01 HID Signo 40 – Wall Mount

02 HID Signo 20 –Mullion Mount

03 HID MaxiProx 5375 – Site Access Gates

C. Door Release Buttons

01 Kneespace

a. DSI ES770 Single or ES771 Dual Knee Space Units

b. Alarm Controls SLP-XM Multi-Button Release

c. One button per controlled security vestibule door with label identifying controlled door.

d. Button shall release the corresponding security vestibule door while button is depressed.

02 Wireless Key Fob

a. Linear Access ACT-31DH Prox Key FOB

b. One each per controlled security vestibule door or motorized gate with label identifying controlled door. Key FOB shall release the corresponding door/gate while button is depressed.

c. Confirm facility and block codes for key fob transmitters with Owner prior to ordering.

03 Or approved equal.

D. Access Cards

01 The district card type is HID part number 1326LMSMV and format is H10301. Site code and numbering to be confirmed with Owner prior to ordering.

2.4 VIDEO INTERCOM SYSTEM

A. Contractor shall provide a network-based communication Video Intercom Solution with integrated door release integration capability.

B. IP Network Compatible Video Intercom System: A network-based communication and security system featuring video entry security, internal communication, emergency stations, and paging. All units and app in the systems shall be able to unlock doors remotely on a network, assist onsite visitors from an offsite location, broadcast emergency announcements, and communicate using a PoE network.

01 Power Source: Power over Ethernet (802.3af).

02 Network Interface: 10 BASE-T / 100 BASE-TX Ethernet (RJ-45).

03 Network Protocols: IPv4, IPv6, TCP, UDP, SIP, HTTP, HTTPS, MJPEG, RTSP, RTP, RTCP, IGMP, MLD, SMTP, DHCP, NTP, DNS.

04 Bandwidth Usage:

a. G.711: 64Kbps x 2 per video call.

b. 64Kbps per monitor.

c. H.264: 24Kbps ~ 2,048Kbps.

05 Communication: Hands-free (VOX), push-to-talk (simplex), or handset (full-duplex).

06 Video Display: 7 inch color LCD.

07 Camera: Type:

a. 1/3 inch color CMOS. 1.23 Megapixels.

b. View Area at 0 degree camera angle mounted at 4 feet 11 inches (1500

mm) AFF: 2 feet 3 inches (700 mm) vertical x 3 feet 9 inch (1150 mm) horizontal at 19 inches (500 mm).

08 Video Stream: ONVIF Profile S.

09 Door Release: Programmable Form C dry contact, 24V AC/ DC, 500mA (use RY-24L for larger contact rating, which requires 24V DC power supply) or use RY-IP44 with 4 multipurpose relays.

10 Wire Type: CAT-5e or CAT-6.

11 Distance:

a. Any station to Network Node: 330 feet (100 meters).

12 Acceptable Manufacturers

a. Acceptable Manufacturer: Aiphone Corp., which is located at: 6670 185th Ave. NE; Redmond, WA 98052 ; Toll Free Tel: 800-692-0200; Tel: 425-455-0510; Fax: 425-455-0071; Web:http://www.aiphone.com

C. Equipment:

01 AIPHONE IX Series

a. Desk mount master station

1) PoE

2) SIP Compatible

3) 7” LCD touchscreen

4) Camera for 2-way video calls

5) Hand-free communication with handset for privacy

6) Compatible slot for microSD card

7) Wall or desk mount

8) AIPHONE IX-MV7-HB IP Video Master Station

b. Audio/Video Door Station with Card Reader.

1) IP Card Access Video Door Station

2) Surface mounted video door station with integral card reader.

3) PoE (with passthrough port) or 24V DC

4) SIP compatible

5) Compatible slot for microSD card

6) Fixed camera

7) Stainless steel panel

8) Weather and vandal resistant

9) AIPHONE IX-DVF-PR w/ matching surface mount box.

c. Audio/Video Door Station with Multiple Call Buttons.

1) IP Card Access Video Door Station

2) Surface mounted video door station with four call buttons. EACS contractor to provide permanent labels suitable for the installed environment identifying each call button.

3) PoE (with passthrough port) or 24V DC

4) SIP compatible

5) Compatible slot for microSD card

6) Fixed camera

7) Stainless steel panel

8) Weather and vandal resistant

9) AIPHONE IX-DVF-4A w/ matching surface mount box.

d. IP Relay Adapter

1) PoE

2) 4 programmable dry contact inputs (N/O or N/C)

3) 4 Form C dry contact closures (N/O or N/C)

4) 6 Form A dry contact closures (N/O)

5) AIPHONE IXW-MA or IP

e. IP Relay Adapter

1) 9-30V DC power supply required.

2) 4 contact inputs

3) 4 relay outputs

4) AIPHONE RY-IP44

02 Strobe Light for Visual Notification

a. Blue Lens with Stainless Steel Trim Plate

b. Xenon Strobe

c. Strobes 60 times per minute when activated.

d. 115mA @ 24VDC, 155mA @ 12VDC, 30mA @ 120VAC

e. Provide synchronization module in areas where more than one strobe is visible.

f. Power from the security system or separate power supply.

g. Acceptable Products:

1) Space Age IAVSTR24B with IGP1SS white trim plate.

2) Or equal with prior approval.

D. Provide the following systems:

01 Door station with card readers at kitchen delivery door and building entry foyer.

a. Kitchen delivery door station shall contact the kitchen manager's office master station.

b. Building entry foyer door station shall contact the main office reception desk master station.

c. Provide strobe lamps on the wall in all areas shown on the drawings or noted in these specifications. Lamps shall activate anytime the associated master station is receiving a call.

02 Door station with multiple call buttons at North entry gate #1 on the first arm of a dual arm pedestal.

a. The gate #1 door station shall be capable of individually contacting the main office reception desk or clinic reception desk master stations using the appropriate call button, either of which may authorize entry into the site.

03 Door station without card reader at East entry gate #13 on the first arm of a dual arm pedestal.

a. The gate #13 door station shall contact the main office reception desk master station which shall authorize entry into the site.

04 Desk mounted master stations in the following locations:

a. Main office reception

b. Kitchen manager's office

c. Clinic reception

05 Coordinate with Owner for rollover settings for each system. Program rollover as directed by the Owner including to the existing AIPhone master station at the existing building reception area.

2.5 EQUIPMENT CABINET AND POWER SUPPLY FOR 12/24VDC AUXILIARY DEVICES

A. Installing contractor shall be responsible for sizing cabinets to house all of the access control and security system central equipment and power supplies.

B. Installing contractor shall be responsible for sizing power supply voltages and capacity for associated control equipment, devices, and electrified door hardware. Provide 25% spare capacity.

C. Coordinate with Division 26 Electrical Contractor for 120V connections to provided equipment.

D. Provide integrated cabinet for access control equipment, security system equipment, and power supplies to be housed in a single container.

01 Altronix Trove

02 Life Safety FlexPower Unified Power Solutions

03 Or approved equal.

E. Locking Hardware and Lock Power

01 Door hardware and power supplies provided by Division 8 Hardware Contractor

02 120V power to door hardware power supplies provided by Division 26 Electrical Contractor

2.6 SITE SECURITY GATES

A. Motorized security gates provided under Division 11.

01 Coordinate with gate contractor for controls and connection requirements.

B. Motorized security gates to be controlled by the building security system.

01 All motorized security gates shall be scheduled and provided with remote control through the building security system.

02 Where provided with a card reader or video intercom, integrate the security gates with those systems to open with the appropriate card or video intercom interaction.

C. Provide all cabling, controllers and miscellaneous components required for a complete and integrated system.

D. Coordinate location of gates controllers, conduit routing and wiring connections with other trades.

01 Each gate shall be provided with power and a 2" underground conduit with

innerduct to a 2-section in ground pull box. Locate pull box at gate actuator and extend 1-1”C for security controls wiring and 1-1”C for power to the gate actuator.

02 Some gates are bi parting style gates with two actuators, each of which shall be individually controlled but connected to the same electrical circuit. Extend a separate 1-1”C for security controls wiring and 1-1”C for power from the local in ground pull box to the second gate actuator.

03 Some gates are provided with a pedestal mounted card reader and/or video intercom unit. Provide a 3/4” conduit from the local in ground pull box to the pedestal.

04 Reference MEP site plan for additional information.

2.7 ETHERNET WITH POWER OVER ETHERNET (POE) UTP EXTENDER

A. The Security Contractor shall provide PoE UTP extenders for out-of-distance security devices.

B. Shall support IEEE 802.3af (PoE) and IEEE 802.3at (PoE+) and PoE++ up to 74W on input and output.

C. Extends cable range up to 3,000ft over UTP Cables.

D. No configuration required.

E. No power supply required.

F. Maintains full-rate network throughput.

G. Manufacturer:

01 Vigitron Midspan Vi2300A (Interior Mounted Only)

02 Vigitron Midspan Vi2301A (Interior Mounted Only)

03 Vigitron Midspan Vi2300W

04 Or approved equal

2.8 CABLING

A. Network cabling installation and color per Division 27.

B. Non-network cabling shall be **ORANGE** and provided/installed under this specification.

2.9 SPARE PARTS AND ATTIC STOCK

A. Provide the following spare devices for each site:

01 Reference 280010 Closeout Requirements.

B. The fire alarm contractor shall include in their bid the cost to furnish and install the additional spare parts and attic stock and all associated cabling. These devices shall be used to fulfill any changes request issued until the list is depleted. Upon the completion of the project, all remaining material shall be delivered to the project for Owner stock. No devices shall be used without documentation and written authorization from the Owner’s representative. Contractor shall obtain a signed transmittal of additional equipment to the owner at the end of the project. The signed transmittal shall be included in the contractor’s closeout documents.

PART 3 - EXECUTION

3.1 TESTING

A. Prior to energizing or testing the system, ensure the following:

01 All products are installed in a proper and safe manner per the manufacturer's instructions.

02 Dust, debris, solder, splatter, etc., is removed.

03 Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

04 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.

3.2 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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.

3.10 LABELING

A. Contractor shall neatly label all security devices and cabling at both ends. All labels shall be on Project as-built drawings.

3.11 DOCUMENTATION

A. Upon completion of the installation, Contractor shall provide full documentation sets to the Consultant for approval as described in section 28 10 00. All documentation shall become the property of the Owner.

B. Documentation shall include the additional specific items detailed in the subsections below:

01 Contractor shall provide hard copy and electronic forms of the final test results.

02 Contractor shall provide a document including the following:

03 Door label/identifier

04 Location of each drop by orientation/permanent landmark in the room

05 Contractor shall provide accurate as-built Construction Drawings. The drawings are to include cable routes and device locations.

3.12 PRE-CHECK OUT

A. The Contractor shall demonstrate the following to Owner during system demonstration.

01 The card readers are fully installed and functional.

3.13 FINAL ACCEPTANCE

A. In addition to closeout requirements in section 28 10 00, This Contractor shall demonstrate the following before final approval.

01 Owner training is complete.

02 Punch list items are complete.

03 As-built documentation is complete and submitted to Owner/Consultant.

3.14 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.

3.15 TRAINING

A. Refer to Section 28 10 00 for additional requirements.

B. Provide system operations, administration, and maintenance training by factory-trained personnel qualified to instruct.

01 Contractor shall provide up to 12 hours of scheduled time in three (3) four (4) hour sessions for system setup and investigation with the Owner.

02 Contractor shall provide training in up to 2 hour blocks of scheduled and dedicated training time for on-site staff.

03 Contractor shall provide training in up to 2 hour blocks of scheduled and dedicated training time for maintenance staff.

04 Provide printed training materials for each trainee, including product manuals, course outline, workbook or student guides, and written examinations for certification.

05 Provide hands-on training with operational equipment.

06 Training shall be oriented to the specific system being installed under this contract as designed and specified.

07 Contractor shall provide all necessary documentation of system operating parameters prior to scheduled training sessions.

3.16 WARRANTY

A. Refer to Section 28 10 00 for additional requirements.

3.17 FINAL PROCEDURES

A. Perform final procedures in accordance with section 28 10 00.

END OF SECTION 28 13 00

SECTION 28 16 00 - VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Refer to Sections 27 00 00 and 28 10 00 for additional project scope information.

1.2 RELATED WORK

A. Division 14 - General Elevator Requirements

B. Section 27 00 00 – General Technology Requirements

C. Section 27 10 00 – Communications Cabling General Requirements

D. Section 27 15 00 – Communications Horizontal Cabling

E. Section 27 16 00 – Communications Connecting Cords

F. Section 28 10 00 – Physical Security General Requirements

G. Section 28 13 00 – Security and Access Control System

1.3 REFERENCE

A. In addition to any requirements below, Contractor shall abide by requirements delineated in 27 00 00 and 28 10 00 including but not limited to:

01 General: Definitions, reference standards and codes, qualifications, pre-construction submittals, construction progress submittals, closeout submittals, and correction period.

02 Products: Substitutions, product specifications, miscellaneous material, cable, connectors, power devices, and interface panels.

03 Execution: Coordination, testing, training, warranty, and cable management.

1.4 GENERAL SUMMARY

A. System shall include IP cameras as described in this section and on the drawings.

B. The Category 6 cabling to each camera shall be provided by the structured cabling Contractor. Patch cords for the IP cameras to the network switches shall be furnished by this Contractor and installed by this Contractor with participation by the Contractor. Patch cords from the IP Camera to the data jack shall be furnished by this structured cabling Contractor 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.

1.5 QUALITY ASSURANCE

A. To ensure a complete uniform installation and single point of responsibility for system design and warranty, one manufacturer shall provide all system components. Mixing of

equipment brands will not be accepted.

B. Acceptable manufacturers of camera equipment shall be **Panasonic / i-Pro**. Contractor must be a current integrator of solutions in the Houston marketplace and be able to include information on current support staff to be able to service this client. **Panasonic / i-Pro** part numbers and configuration are listed in the specification to define equipment capabilities and requirements for this project.

C. Installer Qualifications:

01 The Video Surveillance Installer shall be licensed and shall meet all applicable regulations. The Contractor shall be a firm normally employed in the low voltage and video cabling industry.

02 The contractor shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein. Each contractor shall furnish with their submittal a letter from the manufacture indicating they are a dealer in good standing.

03 The contractor must be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels.

04 The contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of video surveillance distribution systems and have personnel who are adequately trained in the use of such tools and equipment.

05 A resume of qualifications shall be submitted with the Contractor's proposal indicating the following:

a. A list of five recently completed projects using the product proposed of similar type and size with contact names and telephone numbers for each.

b. A list of test equipment proposed for use in verifying the installed integrity of metallic cable systems on this project.

c. A technical resume of experience for the contractor's Project Manager and on-site installation supervisor who shall be assigned to this project.

d. A list of technical product training attended by the contractor's personnel that shall install the video surveillance system shall be submitted.

e. Any subcontractor who shall assist the video surveillance contractor in performance of this work shall have the same training and certification as the video surveillance contractor.

D. The contractor will be required to meet with district representative before any cabling is to be installed to walk the site and coordinate proposed camera locations and cable routing.

E. Contractor is responsible for all electrical work required on this project for connection of cameras, conduit, and power supplies. General Contractor shall be responsible for coordinating between his subcontractors to provide a complete turnkey solution to the owner and be responsible for the complete installation of a security camera system.

F. The Owner's representative reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

1.6 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.

1.7 MOUNTING AND INSTALLATION

A. Contractor shall provide the appropriate mounting hardware for all ceiling types and wall types where cameras shall be located.

B. Wall mounted 180 degree cameras shall be mounted on a gooseneck.

C. Exterior cameras shall be mounted on a gooseneck.

D. Cameras mounted in drop-tile shall have a tile support bridge with a steel support cable connected to structure to prevent theft and vandalism.

1.8 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. Other applicable codes and standards are as follows:

01 ANSI/IEEE C2 – National Electrical Safety Code

02 NFPA 70 – National Electrical Code

03 TIA/EIA 568-C-1, 2, 3 Standards

D. Cameras shall meet the following standards:

01 MPEG-4:

a. ISO/IEC 14496-10 AVC (H.264)

02 Networking:

a. IEEE 802.3af (Power over Ethernet)

03 Network Video:

a. ONVIF Profile S or better

PART 2 - PRODUCTS

2.1 VMS SOFTWARE

A. The District standard is Video Insight.

B. All servers, software, client stations shall be District provided and installed.

C. The video hard drive recorder/server is located in the GPISD Data Center

2.2 DIGITAL IP CAMERAS

A. GENERAL:

01 All cameras and camera licenses shall be provided and installed by the Contractor.

02 For each IP camera the structured cabling contractor shall provide a Cat 6 data cable back to the nearest MDF/IDF, including patch panels and patch cables at two ends. Data cable, jacks, patch panels, patch cords shall be the same products and manufacturers listed under the Network Cabling Section of this

project.

03 Non-network cabling shall be **GREEN** and provided/installed under this specification.

04 Patch cords from outlet to IP cameras shall be provided by Network Cabling Contractor and installed by the 28 16 00 contractor.

B. CAMERA REQUIREMENTS:

01 Tamper resistant with all movable parts enclosed behind a protective cover.

02 Integrated Dome In-Ceiling flush mount and or surface mount

03 Water resistant.

04 All new standard IP cameras shall be PoE (Power over Ethernet) type. Power for IP cameras shall come from data network, typical of all.

05 All indoor and outdoor cameras shall have color and day/night capabilities.

06 Minimum 3 year warranty on all cameras.

C. INDOOR IP COLOR CAMERAS

01 All indoor cameras shall be vandal proof type.

02 2MP Minimum'

03 Verifocal Lens

04 SD Card Slot

05 True Day/Night with IR Cut Filter

06 PoE Powered

07 **Panasonic WV-S32302-F2L**

a. Provide **WV-QWL500-W** mount for wall mounted applications.

D. OUTDOOR IP FIXED COLOR CAMERAS:

01 All exterior cameras shall be vandal proof and weatherproof type.

02 2MP Minimum'

03 IP68

04 IK10 Vandal Resistant

05 Verifocal Lens

06 SD Card Slot

07 True Day/Night with IR Cut Filter

08 PoE Powered

09 Provide 32GB Micro SDHC or SDXC card for local storage of each outdoor camera.

10 **Panasonic WV-U2532LA**

a. Provide **WV-QWL500-W** mount for wall mounted applications.

E. LIFE SKILLS CAMERAS AND MICROPHONE

01 Vandal proof type.

02 2MP Minimum'

03 Verifocal Lens

04 SD Card Slot

05 True Day/Night with IR Cut Filter

06 PoE Powered

07 **Panasonic WV-S32302-F2L**

08 Life Skills Restroom Microphone:

a. Provide a standard Life Skills Camera with the video feed disabled and the lens aimed at the wall/ceiling. Additionally, cover the lens with an opaque material.

F. CAMCLOSURE SERIES MOUNTS

01 Provide camclosure series mounts for ceiling, corner, pendant, wall and miscellaneous adapters shall be manufactured by camera manufacturer.

G. MOUNTING:

01 Provide each camera with mounting accessories to accommodate the specific mounting condition.

a. Cameras at areas with ceiling shall be recessed in the ceiling, provide matching camera tile and support.

b. Cameras at high ceiling or exposed ceiling areas shall be surface or wall mounted, provide a pendent adapter and wall mount as required. Coordinate exact mounting type with Owner prior to rough-in.

H. Field Of View Determination by the contractor as necessary for fixed camera locations shall be performed at no additional cost to provide the view desired by the owner. Contractor shall coordinate all final camera views and locations with owner for final approval.

I. Provide 20'-0" service loops at all camera locations. Support service loops from proper cable support system.

2.3 ETHERNET WITH POWER OVER ETHERNET (POE) UTP EXTENDER

A. The CCTV Contractor shall provide PoE UTP extenders for out-of-distance cameras.

B. Shall support IEEE 802.3af (PoE) and IEEE 802.3at (PoE+) and PoE++ up to 74W on input and output.

C. Extends cable range up to 3,000ft over UTP Cables.

D. No configuration required.

E. No power supply required.

F. Maintains full-rate network throughput.

G. Manufacturer:

01 Vigitron Midspan Vi2300A (Interior Mounted Only)

02 Vigitron Midspan Vi2301A (Interior Mounted Only)

03 Vigitron Midspan Vi2300W

04 Or approved equal

2.4 POWER SUPPLIES

A. Power supplies shall be provided with hard wired electrical connections.

B. The Contractor shall provide power supplies for cameras with heater/blowers, PTZ cameras that require more power than PoE can provide or remote mounted fiber optic

media converters and PoE injectors. The contractor shall select an AC or DC power supply as required for the application.

C. AC wall mount indoor power supply

01 Fuse protected outputs.

02 Contractor shall provide output quantity as required

03 24 VAC @ 4 amps or 28 VAC @ 3.5 amps.

04 Built-in surge suppression.

05 115 VAC, 0.9 amp power input.

06 Wall-mount enclosure with ground stud.

07 Manufacturer:

a. 4 output - Altronix ALTV244

b. 8 output – Altronix ALTV248

c. 16 output – Altronix ALTV2416

d. Or approved equal

D. DC wall mount indoor power supply

01 Fuse protected outputs.

02 Contractor shall provide output quantity and power rating as required accounting for voltage drop and total current output.

03 6VDC – 15VDC field adjustable outputs @ 1 amp each not exceeding 3.5 amps total. The contractor shall meter the far end of the connection to calibrate the power supply and ensure the output voltage meets the powered equipment requirements.

04 Filtered and electronically regulated outputs.

05 115 VAC, 0.9 amp power input.

06 Wall-mount enclosure with ground stud.

07 Manufacturer:

a. 4 output - Altronix ALTV615DC44ULM

b. Or approved equal

E. DC high current wall mount indoor power supply

01 Fuse protected outputs.

02 Contractor shall provide output quantity and power rating as required accounting for voltage drop and total current output.

03 24VDC output @ 10 amps total.

04 Filtered and electronically regulated outputs.

05 115 VAC, 4.4 amp power input.

06 Wall-mount enclosure with ground stud.

07 Manufacturer:

a. 8 output - Altronix AL1024ULACM

b. Or approved equal

F. DC high current exterior power supply

01 Fuse protected outputs.

02 Contractor shall provide output quantity and power rating as required accounting for voltage drop and total current output.

03 12/24VDC output @ 2 amps total.

04 Filtered and electronically regulated outputs.

05 115 VAC, 1 amp power input.

06 12.5" H x 11.5" W x 7.5" D, Non-metallic, lockable NEMA 4X enclosure with adequate space to accommodate fiber optic/copper media converter.

07 Temperature range of -40 to 120 degrees F

08 Provide with pole mount kit when required

09 Manufacturer:

a. 1 output – Honeywell HPS5ULWP

b. Or approved equal

G. AC high current exterior power supply

01 Fuse protected outputs.

02 Contractor shall provide output quantity and power rating as required accounting for voltage drop and total current output.

03 24VAC output @ 4 amps total.

04 Filtered and electronically regulated outputs.

05 115 VAC, 0.9 amp power input.

06 12.5" H x 11.5" W x 7.5" D, Non-metallic, lockable NEMA 4X enclosure with adequate space to accommodate fiber optic/copper media converter.

07 Temperature range of -40 to 120 degrees F

08 Provide with pole mount kit when required

09 Manufacturer:

a. 1 output – Honeywell HP24100ULWP

b. Or approved equal

2.5 SPARE PARTS AND ATTIC STOCK:

A. Provide the following spare devices for each site:

01 Reference 280010 Closeout Requirements.

B. The contractor shall include in his bid the cost to provide and install the additional spare parts and associated wiring as directed by the Owner/engineer. All devices not used during construction shall be turned over to the Owner at the time of job completion as attic stock. No devices shall be used without documentation and written authorization from the Owner's representative.

C. Unused items shall be turned over to the owner within thirty (30) days of substantial completion of the project. Unused material is to be ordered separately when commissioning is scheduled in order to ensure the longest warranty period possible.

D. Contractor shall obtain a signed transmittal of equipment turned over to the owner at the end of the project. The signed transmittal shall be included in the contractor's closeout documents.

PART 3 - EXECUTION

3.1 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.

3.2 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 and coordination as requested by Owner or Consultant.

3.3 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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.

3.9 LABELING

A. Contractor shall neatly label all security devices and cabling at both ends. All labels shall be on Project as-built drawings.

3.10 CAMERA INSTALLATION

A. Contractor shall field verify all camera locations and positioning with Owner prior to installation.

3.11 DOCUMENTATION

A. Upon completion of the installation, Contractor shall provide full documentation sets to the Consultant for approval as described in section 28 10 00. All documentation shall become the property of the Owner.

B. Documentation shall include the additional specific items detailed in the subsections below:

C. Contractor shall provide hard copy and electronic forms of the final test results.

D. 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.

3.12 PRE-CHECKOUT

A. The Contractor shall demonstrate the following to Owner during system demonstration.

01 The cameras are fully installed and functional.

02 Camera adjustments are complete to the Owner's satisfaction including.

a. Aim/Zoom

b. Focus/Back Focus

c. Dehumidification

d. Masking Zones

e. Motion Detection Zones

f. Pre-Sets/Tours

3.13 FINAL ACCEPTANCE

A. In addition to closeout requirements in section 28 10 00, This Contractor shall demonstrate the following before final approval.

01 Owner training is complete.

02 Punch list items are complete.

03 As-built documentation is complete and submitted to Owner/Consultant.

3.14 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.

3.15 TESTING

A. Refer to Section 28 10 00 for additional requirements.

B. Prior to energizing or testing the system, ensure the following:

01 All products are installed in a proper and safe manner per the manufacturer's instructions.

02 Dust, debris, solder, splatter, etc., is removed.

03 Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

04 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.

3.16 TRAINING

A. Refer to Section 28 10 00 for additional requirements.

B. Provide system operations, administration, and maintenance training by factory-trained personnel qualified to instruct.

01 Contractor shall provide up to 12 hours of scheduled time in three (3) four (4) hour sessions for system setup and investigation with the Owner.

02 Contractor shall provide training in up to 2 hour blocks of scheduled and dedicated training time for on-site staff.

03 Contractor shall provide training in up to 2 hour blocks of scheduled and dedicated training time for maintenance staff, including lens and dome cleaning, focusing and positioning.

04 Provide printed training materials for each trainee, including product manuals, course outline, workbook or student guides, and written examinations for certification.

05 Provide hands-on training with operational equipment.

06 Training shall be oriented to the specific system being installed under this contract as designed and specified.

07 Contractor shall provide all necessary documentation of system operating parameters prior to scheduled training sessions.

3.17 WARRANTY

A. Refer to Section 28 10 00 for additional requirements.

3.18 FINAL PROCEDURES

A. Perform final procedures in accordance with section 28 10 00.

END OF SECTION 28 16 00

SECTION 28 46 00 - FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary and Special Conditions, apply to the work specified in this Section.

B. The General Electrical Requirements as specified in Sections 26, apply to the work specified in this Section.

C. Equipment shall meet or follow applicable requirements in other sections of the specifications and on the drawings.

D. Equipment shall meet applicable requirements include in the NEC, UL, NEMA, NFPA and ANSI Standards and be so labeled.

E. Provide Shop Drawings, Submittals and Closeout Documents per Section 26 00 00.

1.2 RELATED WORK

A. Division 8 – Openings

B. Division 11 – Food Service Equipment

C. Division 14 – Elevators

D. Division 21 – Fire Sprinkler System

E. Section 23 09 23 – Direct Digital Control System for HVAC

F. Section 23 09 93 – Sequence of Operations for HVAC Controls

G. Section 26 00 00 – General Electrical Requirements

H. Section 26 00 10 – Closeout Requirements

I. Section 26 05 00 – Common Work Results for Electrical

J. Section 26 09 43 – Network Lighting Controls

K. Section 26 24 00 – Switchboards and Panelboards

L. Section 27 41 00 – Campus Multimedia Systems

M. Section 27 41 50 – Local Sound Systems

N. Section 27 51 00 – Campus Communications Systems

O. Section 28 05 44 – Emergency Responder Radio Antenna

PART 2 - MATERIALS AND METHODS

2.1 GENERAL

A. Design, furnish and install a complete fire alarm system based on a fire alarm panel utilizing addressable architecture with analog intelligent devices as specified herein and shown on the drawings. Equipment shall be manufactured by **Notifier or Silent Knight**. 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.

B. Note that the complete fire alarm system shall be designed by the fire alarm contractor's licensed designer per all applicable codes. In the event that certain devices are shown on the drawings that may be in excess of the minimum code standards, incorporate these additional requirements into the contractor's design since the Owner's requirements are in addition to the minimum code requirements. Devices are shown to indicate the areas of coverage and to provide a means for the electrical contractor to estimate raceway requirements, and to assist in coordinating with architectural constraints. Fire alarm contractor shall produce his own signed, sealed and certified drawings based on his design for submission to the governmental authorities.

01 Provide interlock with BAS controls system to provide current status of the fire alarm system (normal/alarm). The BAS shall enable all lighting upon activation.

C. The following are suggested suppliers of the specified equipment and are provided for reference based on previous experience with these firms.

01 **Notifier** Firetron

02 **Silent Knight** Advantage Security, Dowley Security, Firesafe, Firetron, Convergint Technologies, Wilson Fire, CLS Technology, American Fire Protection Group

D. The system shall consist of all fire alarm panels, manual pull stations, automatic detectors, visual and audible alarm devices 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. Provide Ditek surge suppression protector on 120 volt power connections, telecom connections and for system circuits that extend between buildings.

E. Where detection and alarm devices are shown on the drawings they indicate areas for detection and alarm coverage and not the exact number and placement of devices. 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.

F. Under this Division, engage the services of a fire alarm company who is an authorized distributor for an approved fire alarm system (as indicated below) who shall:

01 Maintain a staff of specialists for engineering assistance, installation and maintenance of the fire alarm system and associated equipment.

02 Stock the required spare parts to keep the fire alarm system in operation.

03 Have proof of experience in the installation and maintenance of the type of fire alarm system specified herein.

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:

01 Two composite wiring diagrams of the system indicating point to point connections, one to be placed in the control panel.

02 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.

03 One bound copy of the complete instructional/operational maintenance manual including as-built drawings, test reports, calculations, etc. to be placed in the control panel.

04 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.

05 All necessary signage as required by locally adopted codes and authorities having jurisdiction. Provide signage and install where required and/or 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.

2.2 SYSTEM LAYOUT

A. Device layout shown on the 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.

B. Provide sound and visual alarm coverage of the building.

C. Provide pull stations at the main panel, remote annunciators, local operator’s consoles, and additionally as indicated on the drawings.

D. Provide smoke detector coverage of all halls and corridors, storage rooms, Central Mechanical Room, each AHU Room, each electrical room and additionally as indicated on the drawings.

E. Provide smoke duct detector in the return air or supply air of each air handling unit. Where return air is not ducted, provide photoelectric coverage of return air openings in the room. Provide smoke duct detector in each fan powered VAV box 2000 CFM or larger.

F. Provide heat detector coverage of all unconditioned occupied spaces, custodial rooms, Central Mechanical Room, each AHU Room, each electrical room and additionally as indicated on the drawings.

G. Main communications and local sound reinforcement systems in the gymnasiums, cafeteria, and classroom projector/audio video speakers shall be automatically muted during the fire alarm system activation to meet audibility requirements. (NFPA Life Safety Code 101, 9.6.3.8, 9.6.3.10.2(3) and National Fire Alarm Code 72, 18.4.4.5, 24.5.13, 24.5.25). However, the school communication system shall remain capable of manual override so that the school staff can deliver voice instructions over the school communications system, such as directing students to return after a fire drill. The General Contractor shall coordinate with all relevant contractors (fire alarm, communications system, audio video, etc.) for this requirement during the bidding period. Include the cost for all cabling, relays, modules, etc. as required to meet these requirements.

H. Interlock alarm with Kitchen hood fire suppression system.

I. Building is fire sprinkled.

01 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.

02 Coordinate with Division 26 to provide a conduit from the building to the fire

sprinkler vault.

J. The building has an elevator.

01 Provide a smoke detector within 6ft of the elevator control panel.

02 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. In the event an alarm is sounded by a device other than these heat detectors, elevator shall be signaled to return to the first floor, but the circuit breakers shall not be tripped.

K. Refer to Drawings for additional information.

2.3 SYSTEM OPERATION

A. Actuation of any alarm initiating device shall cause the following:

01 An LCD readout on the main control panel shall indicate the device in alarm.

02 Alarm tones shall sound throughout the facility. Upon expiration of the alert tone, a digitized predetermined voice evacuation message shall be automatically transmitted throughout the facility via evacuation speakers. The system shall have the capability to generate multiple distinct digital messages as determined by event initiated programs.

03 All horn/flasher alarms shall sound continuously until reset at main panel.

04 De-energize air handling units serving the area in alarm. Also de-energize supply fans, fan powered boxes, VAV boxes, ERV, HVLS fans 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 not required to be controlled.

a. De-energize all high volume low speed (HVLS) fans.

05 Interface with the elevators.

06 Release fire doors and smoke dampers.

07 Transmit alarm warning to remote location via IP communicator. Alarm communication shall send individual point information to the central receiving station.

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.

2.4 SYSTEM PANEL

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, horns and strobes. Devices shall be WHITE in color where that option is available.

01 Silent Knight solutions shall communicate using the SK protocol.

B. CONTROL PANEL: The control panel shall be a microprocessor based, addressable intelligent system enclosed in a semi-flush style cabinet in finished spaces or surface mounted cabinet in equipment spaces. 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 be limited to the following:

01 Control modules as required to provide system monitoring, alarm control, trouble sensing and remote equipment control.

02 City/remote station module to service as interface unit between the fire alarm control panel and an authorized remote monitoring point.

03 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. System shall also meet additional spare capacity requirements below.

04 Sealed and rechargeable battery supply, sized for 24 hour sensing and 15 minute alarm capability. System shall also meet additional spare capacity requirements below.

05 Remote alarm signal distributing panels with power supplies as needed by final design of the fire alarm contractor. Remote power supplies shall be located in mechanical and electrical rooms. Do not install in storage rooms or finished spaces.

06 All power supplies, amplifiers and battery supplies shall be sized based on the system installed plus 50% additional alarm devices. For example, no more than 4A shall be allocated on a 6A power supply or 50W on a 75W amplifier to provide spare capacity for future growth. Power supply, amplifier and battery calculations must be submitted for engineer review.

07 Acceptable Models:

a.	Silent Knight	6820XL-EVS
b.	Notifier	Model NFS-640 with DVC Audio Option

2.5 VOICE COMMUNICATIONS

A. The voice communications panel shall be modular in design utilizing solid state microprocessor circuitry. The voice evacuation system shall integrate with the main fire alarm control panel. Side car voice evacuation systems are not acceptable.

B. Communications Controls: The communications control panel shall incorporate the following controls and indicators:

01 All call

02 General alarm

03 Audio trouble LED

04 Audio level LED

05 Manual tone/MESSAGE select switches with LED indicators

06 Communications zone select switches and select indicators

07 Communications monitor speaker with volume control

08 Dynamic paging microphone

C. Paging

01 The microprocessor based one-way paging system shall be provided with a means to selectively activate voice, tones or digitized messages to any or all zones in the system via electronic membrane touch-pad controls. In addition,

visual indication by zone will be provided.

02 Each audio/speaker circuit will be totally supervised for opens, shorts or grounds with direct shorts prohibiting selection of the respective zone. All audio circuits shall be power limited. Each speaker zone shall be provided with an amber trouble LED for circuit trouble conditions and an active/on LED indicator.

03 Alarm/Paging zones shall be provided as required.

04 Provide combination supervised remote microphone and annunciator for the voice evacuation system at each remote annunciator location meeting the UL requirements for a Local Operator's Console (LOC).

D. Alarm Electronics

01 The voice communications center shall be a microprocessor based, supervised, multi-function, audio generator. The communications generator shall contain:

a. Independent Voice communications CPU.

b. Nonvolatile RAM memory.

c. One custom digitized message circuits.

d. Up to four selectable tone generator/oscillators.

e. Each sub circuit of the communications center shall be fully supervised and failure of any tone oscillator or digital message generator shall revert the system to the default standby generator.

02 The system shall be provided with a custom field programmable digitized message.

03 The system shall provide adequate audio amplification. The system shall be capable of amplifier capacity and expansion as required. Each amplifier shall be continuously monitored electronically for proper output level. Each unit shall be equipped with diagnostic indicators. Each amplifier shall provide a minimum of 50 watts of 25 VRMS of power. Each unit shall be equipped with its own individual power/pilot LED, audio input trouble LED, battery input trouble LED, and amplifier trouble/fail LED. Provide amplification for 1/2 watt per speaker plus 33% spare capacity. Electrical Contractor shall provide and install a 120 VAC dedicated circuit to each remote amplifier cabinet (if needed).

2.6 REMOTE EQUIPMENT

A. MANUAL PULL STATIONS: Addressable type, red Lexan, non-coded, dual action type.

01 Provide Stopper II cover with battery powered sounder to all pull stations except those at the remote annunciator and fire alarm panel.

B. AREA SMOKE DETECTORS: White, analog addressable, photoelectric type, non-polarized with 360° smoke entry, LED normal/alarm status light and separable base.

C. 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.

01 Provide a duct smoke detector located within 5 feet of each smoke or fire/smoke damper. Reference mechanical drawings for locations.

D. HEAT DETECTORS: White, analog addressable. Heat detectors shall be rate of rise type except in kitchen spaces which shall be 135°F fixed temperature.

E. CARBON MONOXIDE DETECTORS: White, analog addressable electrochemical type,

with separate CO detection signal. LED normal/alarm status light and separable base. May be combination carbon monoxide and smoke detector in one device.

F. COMBINATION DETECTORS:

01 Where smoke, heat and/or carbon monoxide detectors are shown together they may be combined into a single device meeting all requirements and functionality were they to be provided separately.

G. HORNS: White, semi-flush, ADA compatible, electronic horn with high visibility, synchronized strobe and field selectable sound level. Set level based on individual application (hall, classroom, restroom, office, etc.) Audible portion shall sound a three beat temporal tone for alarm signaling as required by NFPA. Strobe intensity shall conform to NFPA Chapter 6 requirements and also 75 candela to meet ADA and TAS requirements.

H. SPEAKERS AND SPEAKER STROBES: White, semi-flush, ADA compatible, electronic speakers with high visibility, synchronized strobe and field selectable volume. Set volume level based on individual application (hall, classroom, restroom, office, etc.) Audible portion shall comply with audibility and intelligibility standards as required by NFPA. Strobe intensity shall conform to NFPA Chapter 6 requirements and also 75 candela to meet ADA and TAS requirements.

I. STROBE LIGHTS: White, semi-flush, ADA compatible, synchronized strobe with intensity suitable for the individual application (hall, classroom, restroom, office, etc.). Strobe intensity shall conform to NFPA 1993 Chapter 6 requirements and also 75 candela to meet ADA and TAS requirements.

J. FIRE SPRINKLER SYSTEM ALARM BELL: Bells shall have underdome strikers and operating mechanisms. Gongs on said bells shall be no smaller than nominal 6″ with an operating voltage of 24VDC. Bells shall be suitable for surface or semi-flush mounting. Outdoor surface mounted installations shall be weatherproof using weatherproof backbox. Otherwise bells shall mount to a standard 4″ square electrical box having a maximum projection of 2½″. Bells shall be located on the exterior wall outside the fire sprinkler riser room or as determined by the Authority Having Jurisdiction. Bells shall be listed for indoor/outdoor use by Underwriters Laboratories and approved by Factory Mutual and MEA.

K. DIGITAL COMMUNICATOR: Two channel IP based dialer to automatically call two different designated numbers in the event of a fire or system trouble.

L. RELAYS: Provide and install control relays to perform the specified functions. This includes relays to shut down the various HVAC equipment. 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.

M. WEATHERPROOF: Devices located outside, even if sheltered from rain shall be weatherproof and suitable for outdoor installation.

N. PROTECTIVE GUARDS: Provide Stopper Type Lexan protective guards on devices located in gymnasiums, shop spaces, and locker rooms, and in additional areas noted on the Drawings.

O. REMOTE STROBE CONTROLLER: Provide local controller as necessary to power and synchronize flash for strobe devices.

P. REMOTE ANNUNCIATOR / LOCAL OPERATOR CONSOLE: Provide combination supervised remote microphone and annunciator for the voice evacuation system at each remote annunciator location meeting the UL requirements for a Local Operator’s Console (LOC). Remote paging microphone shall be installed in recessed cabinet. Remote paging microphone type and operation shall match the one provided at the main system panel. Coordinate desired all-call and selective paging settings with Owner.

Q. REMOTE PAGING MICROPHONE: Provide remote paging microphone in recessed cabinet at each remote annunciator location. Remote paging microphone shall match the one provided at the main system panel. Coordinate desired all-call and selective paging settings with Owner.

R. SURGE SUPPRESSOR: Provide surge suppressor for each fire alarm panel, remote power supplies, amplifiers, expansion panels, etc. Note surge suppression unit must be a minimum of three feet from the panel.

01 Fire Alarm Control Panels:

a. Total surge protection solution in NEMA 1 enclosure with 120V surge protection and up to ten pairs of SLC, IDC/PIV, NAC, or dialer circuits. Install above ceiling at fire alarm panel where installed in finished spaces or adjacent to panel where installed in building equipment spaces.

b. Fire alarm panel shall monitor the 120 volt suppressor dry contact so panel will go into failure if the suppressor is inoperable.

c. Provide breaker lockout kit on 120V circuit serving fire alarm panel.

d. Basis of design: Ditek DTK-TSS1 w/ DTK-2MHLP

02 Fire Alarm Power Supplies, Amplifiers, Expansion Panels, and miscellaneous 120V circuits.

a. Provide surge suppression protection on all 120 volt power connections serving fire alarm circuits.

b. Provide breaker lockout kit on all 120V fire alarm circuits.

c. Basis of design: Ditek DTK-120HWLOK

03 Fire Alarm Low Voltage Systems:

a. Provide surge suppression protection for system low voltage circuits (including telecom circuits) that extend to the exterior of the building or between buildings.

04 Approved Equipment

a. Ditek DTK-TSS1

b. Ditek DTK-120SRD

c. Ditek DTK-120S1

d. Ditek 2MHLPB Series

e. Ditek MRJ Series

f. Ditek DTK-2LVLPF

g. Ditek DTK-120HWLOK

h. Or equal with prior written approval.

S. SPECIAL EQUIPMENT LABELING AND DEVICES

01 Coordinate with electrician to provide red circuit lockout device on all circuit breakers serving fire alarm equipment and devices. Provide additional lockout devices for any circuits added per the fire alarm contractor’s design for power supplies, amplifiers, etc.

a. Space Age Electronics ELOCK-FA E-Series Lockout Kit, lockout kit provided with Ditek DTK-120HWLOK, or equal with written approval.

b. Confirm kit is compatible with provided electrical gear prior to ordering.

02 Electrical Equipment Field Nameplates:

a. Provide typewritten label with white letters on a contrasting red background reading “FA” permanently attached to the panel dead front adjacent to each breaker.

b. Provide typewritten label with white letters on a contrasting red background permanently attached to the outside of the panel cover reading ‘FIRE ALARM CIRCUIT INSIDE” or similar.

03 Fire Alarm Equipment Field Nameplate:

a. Provide 2.25” x 4” lamacoid master nameplate for each fire alarm panel, power supply, amplifier, expander panel, or similar equipment with ½” high engraved letters for equipment name and ¼” high letters for system circuit information and mounting holes.

1) In unfinished spaces attach nameplate with mastic and two screws to panel front cover.

2) In finished spaces attach nameplate with mastic to inside of panel front cover.

b. Coordinate with Division 26 to give same circuit name and number as shown on panelboard schedule.

T. DOCUMENT CABINET

01 Provide a wall mounted document cabinet, factory finished in red enamel, with all required documents inside. Cabinet shall incorporate an integral flash drive, minimum 8GB in size, with a digital copy of system closeout documents.

02 This panel shall be located near and keyed the same as the FACP. Install flush mounted in finished spaces.

03 Basis of Design: Space Age Electronics SSU00685

U. KEYS

01 Reference 280010 Closeout Requirements.

V. LINE ISOLATOR MODULES

01 Silent Knight SK-ISO or equal by system manufacturer.

02 Provide at following locations at a minimum:

a. Main Panel

PART 3 - EXECUTION

3.1 INSTALLATION

A. WIRING:

01 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.

02 All wiring shall be installed in conduit. In existing areas not in mechanical rooms,

use metal, Wiremold surface raceway where exposed. Low smoke wiring may be installed without conduit above accessible ceilings if wiring is supported at structure or walls 48” on center with cable rings or other manufactured devices specifically designed for supporting cable. Do not support from data system cable rings. Provide conduit sleeve with protective end fittings through all walls and floors where raceway system is not installed. All connections shall be in supported junction boxes. All auxiliary control circuits shall be connected to NAC type circuits and be supervised per NFPA.

03 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.

04 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.

05 The minimum wire sizes to be used when not otherwise directed by Codes are as follows:

a.	Detector Circuits	#18 AWG
b.	Remote Annunciators	#18 AWG
c.	Remote Alarm Lamps	#18 AWG
d.	Notification Circuits:	#14 AWG (up to 1.1 A) or larger as necessary
e.	Speaker Circuits	#16 AWG Twisted/Shielded
f.	120 volt or higher	#12 AWG
g.	All other wiring	#18 AWG

06 Limited energy cable for 24 volt low voltage systems shall be Plastic Wire and Cable Company Low Energy Safety Control Wire, 90° C, red, or equal.

a. Provide solid core up to #14 AWG and stranded for #12 AWG and larger.

07 Should 120 volt power be required other than at the main panel, include the cost of additional circuits.

B. RACEWAY SYSTEMS

01 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.

02 See Section Common Work Results for Electrical for conduit types and installation requirements.

C. CEILING SUPPORTS: All devices installed in lay-in ceilings shall have bracket to support device from ceiling tees.

D. MOUNTING HEIGHTS

01	PULL STATIONS:	46" above finished floor to top
02	HORNS/SPEAKERS/STROBES:	82" or 6" below ceiling (or on ceiling)

E. LABELING:

01 All devices shall be labeled with their system address in ¼” tall black letters using vinyl tape or vinyl lettering.

02 Coordinate with electrician to identify each panel and circuit serving fire alarm equipment and devices as required by code and these specifications. Labeling

and lockout devices on electrical panels shall be provided and installed by division 26, reference specification 262400 ELECTRICAL SWITCHBOARDS PANELBOARDS.

03 Provide lamacoid label on front face of each power supply, expansion panel, equipment cabinet, etc. identifying the electrical circuit feeding the equipment. Where the equipment is located in a finished space the labeling may be done with a permanent marker on the inside of the cabinet where it can be easily identified.

F. REMOTE LED INDICATOR: Any automatic detection device concealed from view, such as a duct detector for an FCU above the ceiling, shall have a remote alarm lamp with engraved steel faceplate on the ceiling or wall visible from an occupied space.

3.2 TESTING

A. 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:

01 INITIATING DEVICES: Each initiating device shall be activated and proper operation of all visual and audible alarm and auxiliary devices shall be demonstrated.

02 DUCT AND PHOTOELECTRIC DETECTORS: Each detector shall be adjusted with electronic measuring equipment for calibration sensitivity. Each detector shall subsequently be checked for operation.

03 AUDIBLE ALARM DEVICES: Each audible alarm device shall be tested for proper operation and connection to the correct circuit.

B. FIRE MARSHAL REVIEW: System shall be demonstrated to the local Fire Marshall for his review and approval. Make adjustments as required to obtain the approval for certificate of occupancy. Provide minimum 48 hour advance notice of the demonstration to the Owner/Engineer so they may be in attendance.

3.3 SPARE PARTS AND ATTIC STOCK

A. Provide the following spare devices for each site:

01 Reference 280010 Closeout Requirements.

B. The fire alarm contractor shall include in their bid the cost to furnish and install the additional spare parts and attic stock and all associated cabling. These devices shall be used to fulfill any changes request issued until the list is depleted. Upon the completion of the project, all remaining material shall be delivered to the project for Owner stock. No devices shall be used without documentation and written authorization from the Owner's representative. Contractor shall obtain a signed transmittal of additional equipment to the owner at the end of the project. The signed transmittal shall be included in the contractor's closeout documents.

3.4 CLOSEOUT DOCUMENTATION

A. Upon completion of testing and certification of the system performance and operation as specified the contractor shall submit a complete set of closeout documentation in PDF format.

01 Reference 280010 Closeout Requirements.

3.5 WARRANTY

A. Reference 280010 Closeout Requirements.

B. Post-warranty maintenance shall be available on contract or call basis.

3.6 TRAINING

A. Provide designated representatives of the Owner with complete technical training in the proper operation of the system, at a time mutually convenient. They shall assist in the preparation of a set of detailed operating instructions for the system.

B. Provide number of hours and quantity of training sessions to Owner's general and maintenance personnel as required in specification section 280010 Closeout Requirements.

END OF SECTION 28 46 00

SECTION 33 0000

EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Clearing, stripping and scrubbing of site area that are shown to receive improvements.

B. Stockpiling of stripped topsoil on the site.

C. Excavation, stabilizing and backfill of Building Pad.

D. Earthwork preparation for the entire project areas within the limit of grading.

E. Stabilized subgrade for paving.

F. Excavating for foundations.

G. Trenching, backfilling, and compacting.

H. Rough and fine grading

1.3 RELATED WORK

A. Testing Laboratory Services – Section 01 4529

B. Storm Water Pollution Prevention – Section 01 5200.

C. Lawn & Grasses – Division 32

D. Concrete – Section 03 3000.

1.4 QUALITY ASSURANCE

A. Testing Laboratory Services
   01 Test results shall meet or exceed established standards.

1.5 REFERENCES (INCLUDING LATEST REVISIONS)

A. American Society for Testing and Materials
   01 ASTM D698, Tests for Moisture Unit Weight Relations of Soils and Soil - Aggregate.
   02 ASTM D2922, Test for Density of Soil and Soil-Aggregate In Place by Nuclear Method.
   03 ASTM D1557, Moisture-density Relations of Soils and Soil-Aggregate Mixtures.

PART 2 - MATERIALS

2.1 GENERAL SOIL MATERIALS

A. Select Backfill and Fill - Clayey sand or inactive lean clay with a liquid limit between 26 and 40 and a Plasticity Index of minimum 10 to maximum 20.

B. Site fill at lawn

01 Free of vegetation, large clumps, or other foreign materials.
02 Previously stripped topsoil may be used at lawn if free of trash, rock, debris and other foreign materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Proposers shall examine the job site conditions and be prepared to complete all work specified herein.

B. The Owner's surveyor has established the property lines and corners. The Contractor will be required to establish, maintain, and be responsible for all other reference points, hubs, grades, elevations, lines, and surface measurements. If any discrepancies in the survey information furnished in the documents is found, the Contractor shall promptly notify the Architect and await instructions before proceeding.

C. It shall be the Proposer's responsibility to determine during the proposal period the extent of the herein specified fill materials which must be obtained from off-site sources. The Contractor shall not be due any additional sums for his failure to properly estimate cut and fill requirements.

3.2 PREPARATION

A. Unknown Utilities and obstacles
01 If any unknown or uncharted utilities or objects which would be utilities are encountered during excavation, promptly notify the Architect before proceeding. Arrange with utility and telephone companies for removal and relocation of their equipment, and capping of pipes and wiring as required.

B. Clearing, Grubbing, and Stripping
01 Remove all trees, shrubs and other vegetation within the limit of grading, except those so indicated to remain.
02 Trees and stumps shall be removed intact with main root ball, along with the principal roots to a minimum two feet below ground surface.
03 After all growth has been removed the scarify these areas to a depth of approximately 12 inches by root plow or similar item.
04 Use hand methods of grubbing inside dripline of trees indicated to remain.
05 Fill depressions with approved fill materials, place fill material in layers not exceeding 6 inch loose depth and thoroughly compact to density of adjacent original ground.
06 Strip all roots, surface vegetation and loose top soil to a depth of at least 6 inches under improved area and stockpile top soil in approved locations.
07 Foundation of demolished existing structure should be cut off at least one foot (1') below the existing structure. Demolish existing caps, grade beams and top of drilled footings and spread footings as required to install new grade beams, footings and building pad.

C. Excavating
01 Excavate the elevations and dimensions indicated, plus sufficient space to permit erection of forms, and fill.
02 Footing: Floor and wall excavations shall be finished level. 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.

D. At Building Pad
01 Remove thirty (30) inches minimum of existing fill material.

02 Cut subgrade to minimum seventy-two (65) inches below the proposed finish floor elevation. Scarify subgrade to 6" depth and compact to 95% density and a moisture content of -1 to +3 percent of the optimum moisture content.

02 Proof roll exposed subgrade with a heavy pneumatic tired roller and tested by a testing co. to verify conditions are as anticipated.

03 Backfill the excavation to within six (6) feet of final pd elevation using on site-soils with a PI of 30 or less. Backfill the final six (6) feet below final pad elevation with select fill.

04 Refer to Structural Drawings for additional requirements.

E. Preparation of Subgrade for Pavements

01 Shape subgrades by cutting and filling as required. Prior to placing fill, compact subgrade by proof-rolling at optimum moisture content to approximately ninety-five (95)% percent of Standard Proctor Density (AASHO Method T-99) in compliance with THD, Item 216. Fill shall be placed in eight (8) inch lifts and compacted to 95% Standard Proctor. Correct deviations exceeding 1/2 inch in 16 ft. by reshaping and recompacting.

02 Stabilize the upper six (6) inches of concrete paving area. Refer to Civil Drawings for Lime or Cement stabilization requirements.

04 Extend lime stabilization min. of one feet beyond the edge of the pavement.

05 Compact lime-soil mixture with approved compaction equipment to minimum 95% of the maximum standard dry density (ASTM D698) at a moisture content from 2% below to 2% above the optimum moisture content.

06 Prior to placing any fill or after establishing required cut, proof roll all areas with approved multiple-wheel pneumatic tired rollers, vibrating rollers or other types of acceptable rollers, to detect soft spots and other undesirable conditions. Correct undesirable conditions. Undercut all soft areas and replace with suitable materials and compact.

F. 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:

01 Adequately dry the surficial soils by discing these materials.

02 Dry the surficial soils by blending hydrated lime with the unsuitably wet soils.

03 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.

3.3 BACKFILL AND FILL

A. General

01 Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

a. In excavations, use approved excavated or borrow material (P.I. of 10 to 20).

b. For general fill and under grassed areas, use approved excavated material.

c. Under walks and pavements, use approved excavated or borrow material, or combination of both.

d. Under building pad, use select fill material (P.I. of 10 to 20).

02 Backfill excavations as promptly as work permits, but not until completion of the following:

a. Acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.

b. Inspection, testing, approval, and recording locations of underground utilities.

c. Removal of concrete form work.
d. Removal of trash and debris.

B. Placement

01 Place backfill and fill materials in layers not more than 8 inches in loose depth at a moisture content within ± 2% of optimum (-1 to +3 for select fill).

02 Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

03 Place backfill and fill materials adjacent to structures evenly to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

04 If trench excavations pass within 18 inches and are carried below column or wall footings, backfill trenches with concrete to level of bottom of adjacent footing.

05 Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect. Use care in backfilling to avoid damage or displacement of pipe systems.

C. Backfill for piping as shown.

D. After pavements, walks and concrete work are in place, fill final 2 inches of site (to limits of grading shown) with approved topsoil, placing to allow for settlement. Pulverize top soil, fine grade and rake for grass planting.

3.4 COMPACTION

A. General

01 Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content of –2 to 2% of optimum (-1 to +3 for select fill). Compact each layer to required percentage of maximum dry density for each area classification.

02 Control soil compaction during construction providing minimum percentage of density specified for each area classification.

B. Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D698; and not less than the following percentages of relative density, determined in accordance with ASTM D2409, for soils which will not exhibit a well-defined moisture density relationship.

01 Lawn and Unpaved Areas. Compact top 6 inches of each layer of backfill or fill material to 90% maximum dry density.

02 Sidewalks. Compact top 6 inches of subgrade and each layer of backfill or fill material to 95% of maximum density.

03 Building Pad: Compact each layer of backfill or fill material to 95% of maximum dry density.

3.5 GRADING

A. General

01 Uniformly grade areas within limits of grading shown. Smooth finished surface within specified tolerances, compact to uniform slopes between points where elevations are shown, or between such points and existing grades.

02 Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

B. Tolerances

01 Finish surfaces free from irregular surface changes, and as follows:

a. Lawn and Unpaved Areas. Finish areas to receive topsoil to within not more than 0.10 ft. above or below required subgrade elevations.

b. Walks. Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 ft. above or below required subgrade elevation.

c. Pavements. Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.

3.6 MAINTENANCE

A. Protection of Graded Areas

01 Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

02 Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas

01 Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

3.7 MATERIAL DISTRIBUTION AND CLEAN-UP

A. Remove excavated material, trash, debris and waste materials and legally dispose of it off Owner's property.

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. Unit Prices.

1. No separate payment will be made for work performed under this Section. Include cost of such work in Contract unit prices for items listed in bid form requiring cement stabilized sand.
2. Refer to Paragraph 3.04 for material credit.
3. Refer to Division 1 for unit price procedures.

B. 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 2.03, 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 1.5 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: 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 12-inch-thick loose lifts and compact to 95 percent of maximum density as determined in accordance with ASTM D 558, unless otherwise specified. Refer to related specifications for thickness of lifts in other applications. Target moisture content during compaction is +3 percent of optimum. Perform and complete compaction of sand-cement mixture within 4 hours after addition of water to mix at plant.

B. Do not place or compact sand-cement mixture in standing or free water.

3.2 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Division 1.

B. One sample of cement stabilized sand shall be obtained for each 150 tons of material placed per day with no less than one sample per day of production. Random samples of delivered cement 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 purposes.

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 the same time material is being used, but no later than 4 hours after water is added to mix.

D. After molding, specimens will be removed from molds and cured in accordance with ASTM D 1632.

E. Specimens will be tested for compressive strength in accordance with ASTM D 1633, Method A. Two specimens will be tested at 48 hours plus or minus 2 hours and two specimens will be tested at 7 days plus or minus 4 hours.

F. A strength test will be average of strengths of two specimens molded from same sample of material and tested at same age. Average daily strength will be average of strengths of all specimens molded during one day's production and tested at same age.

G. Precision and Bias: Test results shall meet recommended guideline for precision in ASTM D 1633 Section 9.

H. Reporting: Test reports shall contain, as a minimum, the following information:

1. Supplier and plant number
2. Time material was batched
3. Time material was sampled
4. Test age (exact hours)
5. Average 48-hour strength
6. Average 7-day strength
7. Specification section number
8. Indication of compliance / non-compliance
9. Mixture identification 3
10. Truck and ticket numbers
11. The time of molding
12. Moisture content at time of molding
13. Required strength
14. Test method designations
15. Compressive strength data as required by ASTM D 1633
16. Supplier mixture identification
17. Specimen diameter and height, in.
18. Specimen cross-sectional area, sq. in.

3.3 ACCEPTANCE

A. Strength level of material will be considered satisfactory if:

1. The average 48-hour strength is greater than 100 psi with no individual strength test below 70 psi.
2. All 7-day individual strength tests (average of two specimens) are greater than or equal to 100 psi.

B. Material will be considered deficient when 7-day individual strength test (average of two specimens) is less than 100 psi but greater than 70 psi. See Paragraph 3.04 Adjustment for Deficient Strength.

C. The material will be considered unacceptable and subject to removal and replacement at Contractor's expense when individual strength test (average of two specimens) has 7-day strength less than 70 psi.

D. When moving average of three daily 48-hour averages falls below 100 psi, discontinue shipment to project until plant is capable of producing material, which exceeds 100 psi at 48 hours. Five 48-hour strength tests shall be made in this determination with no individual strength tests less than 100 psi.

E. Testing laboratory shall notify Contractor, Owner's Representative, and material supplier by facsimile of tests indicating results falling below specified strength requirements within 24 hours.

F. If any strength test of laboratory cured specimens falls below the specified strength, Contractor may, at his own expense, request test of cores drilled from the area in question in accordance with ASTM C42. In such cases, three (3) cores shall be taken for each strength test that falls below the values given in 3.03.A.

G. Cement stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least 100 psi and if no single core is less 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: Credit per Cubic Yard = $30.00 x 2 (100 psi - Actual psi) 100

C. When mixture produces 7-day compressive strength less than 70 pounds per square inch, then remove and replace cement-sand mixture and paving and other necessary work at no cost to Owner.

END OF SECTION 31 06 20.15

SECTION 31 06 20.17
UTILITY BACKFILL MATERIALS

PART 1 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. Unit Prices.

1. No payment will be made for backfill material. Include payment in unit price for applicable utility installation.
2. Payment for backfill material, when included as separate pay item or when directed by Owner's Representative, is on cubic yard basis for material placed and compacted within theoretical trench width limits and thickness of material according to Drawings, or as directed by Owner's Representative.
3. Payment for backfill of authorized over-excavation is in accordance with Division 31.
4. Refer to Division 1 for unit price procedures.

B. 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 2.03, Material Testing.

D. Before stockpiling materials, submit copy of approval from landowner for stockpiling backfill material on private property.

E. Provide delivery ticket which includes source location for each delivery of material that is obtained from off-site sources or is being paid as specific bid item.

1.6 TESTS

A. Perform tests of sources for backfill material in accordance with Paragraph 2.03B.

B. Verification tests of backfill materials may be performed by Owner in accordance with Division 1.

PART 2 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 2.01B, or by product descriptions, as given in Paragraph 2.02.

B. Class Designations Based on Laboratory Testing:

1. Class I: Well-graded gravels and sands, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW, SW):
   a. Plasticity index: non-plastic.
   b. Gradation: D60/D10 - greater than 4 percent; amount passing No. 200 sieve - less than or equal to 5 percent.
2. Class II: Poorly graded gravels and sands, silty gravels and sands, little to moderate fines (GM, GP, SP, SM):
   a. Plasticity index: non-plastic to 4.
   b. Gradations:
      1) Gradation (GP, SP): amount passing No. 200 sieve - less than 5 percent.
      2) Gradation (GM, SM): amount passing No. 200 sieve - between 12 percent and 50 percent.
      3) Borderline gradations with dual classifications (e.g., SP-SM): amount passing No. 200 sieve - between 5 percent and 12 percent.
3. Class III: Clayey gravels and sands, poorly graded mixtures of gravel, sand, silt, and clay (GC, SC, and dual classifications, e.g., SP-SC):
   a. Plasticity index: greater than 7.
   b. Gradation: amount passing No. 200 sieve - between 12 percent and 50 percent.

4. Class IVA: Lean clays (CL).
    a. Plasticity Indexes:
        1) Plasticity index: greater than 7, and above A line.
        2) Borderline plasticity with dual classifications (CL-ML): PI between 4 and 7.
    b. Liquid limit: less than 50.
    c. Gradation: amount passing No. 200 sieve - greater than 50 percent.
    d. Inorganic.
5. Class IVB: Fat clays (CH)
    a. Plasticity index: above A line.
    b. Liquid limit: 50 or greater.
    c. Gradation: amount passing No. 200 sieve - greater than 50 percent.
    d. Inorganic.
6. Use soils with dual class designation according to ASTM D 2487, and which are not defined above, according to more restrictive class.

2.2 PRODUCT DESCRIPTIONS

A. Soils classified as silt (ML) silty clay (CL-ML with PI of 4 to 7), elastic silt (MH), organic clay and organic silt (OL, OH), and organic matter (PT) are not acceptable as backfill materials. These soils may be used for site grading and restoration in unimproved areas as approved by Owner's Representative. Soils in Class IVB, fat clay (CH) may be used as backfill materials where allowed by applicable backfill installation specification. Refer to Division 31.

B. Provide backfill material that is free of stones greater than 6 inches, free of roots, waste, debris, trash, organic material, unstable material, non-soil matter, hydrocarbon or other contamination, conforming to following limits for deleterious materials:

1. Clay lumps: Less than 0.5 percent for Class I, and less than 2.0 percent for Class II, when tested in accordance with ASTM C 142.
2. Lightweight pieces: Less than 5 percent when tested in accordance with ASTM C 123.
3. Organic impurities: No color darker than standard color when tested in accordance with ASTM C 40.

C. Manufactured materials, such as crushed concrete, may be substituted for natural soil or rock products where indicated in product specification, and approved by Owner's Representative, provided that physical property criteria are determined to be satisfactory by testing.

D. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by Unified Soil Classification System (ASTM D 2487) meeting following requirements:

1. Less than 15 percent passing number 200 sieve when tested in accordance with ASTM D 1140. Amount of clay lumps or balls may not exceed 2 percent.
2. Material passing number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318: Plasticity index: not exceeding 7.

E. Concrete Sand: Natural sand, manufactured sand, or combination of natural and manufactured sand conforming to requirements of ASTM C 33 and graded within following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

F. Gem Sand: Sand conforming to requirements of ASTM C 33 for course aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8”	95 to 100
No. 4	60 to 80
No. 8	15 to 40

G. Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
1/2”	100
3/8”	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

H. Crushed Aggregates: Crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

1. Materials of one product delivered for same construction activity from single source, unless otherwise approved by Owner’s Representative.
2. Non-plastic fines.
3. Los Angeles abrasion test wear not exceeding 45 percent when tested in accordance with ASTM C 131.
4. Crushed aggregate shall have minimum of 90 percent of particles retained on No. 4 sieve with 2 or more crushed faces as determined by Tex-460-A, Part I.

5. Crushed stone: Produced from oversize plant processed stone or gravel, sized by crushing to predominantly angular particles from naturally occurring single source. Uncrushed gravel is not acceptable materials for embedment where crushed stone is shown on applicable utility embedment drawing details.
6. Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, reinforcing steel fragments, soil, waste gypsum (calcium sulfate), or debris.
7. Gradations, as determined in accordance with Tex-110-E.

Sieve	Percent Passing by Weight for Pipe Embedment By Ranges of Nominal Pipes Sizes		
	>15”	15” – 8”	< 8”
1”	95 – 100	100	--
¾”	60 – 90	90 – 100	100
½”	25 – 60	--	90 – 100
3/8”	--	20 – 55	40 – 70
No. 4	0 – 5	0 – 10	0 – 15
No. 8	--	0 – 5	0 – 5

I. Select Backfill: Class III clayey gravel or sand or Class IV lean clay with plasticity index between 7 and 20 or clayey soils treated with lime in accordance with Division 31 to meet plasticity criteria.

J. Random Backfill: Any suitable soil or mixture of soils within Classes I, II, III and IV; or fat clay (CH) where allowed by applicable backfill installation specification. Refer to Division 31.

K. Cement Stabilized Sand: Conform to requirements of Division 31.

L. Concrete Backfill: Conform to Class B concrete as specified in Division 32.

M. Flexible Base Course Material: Conform to requirements of applicable portions of Division 33.

2.3 MATERIAL TESTING

A. Source Qualification. Perform testing to obtain tests by suppliers for selection of material sources and products not from the project site. Test samples of processed materials from current production representing material to be delivered. Use tests to verify that materials meet specification requirements. Repeat qualification test procedures each time source characteristics change or there is planned change in source location or supplier. Include the following qualification tests, as applicable:

1. Gradation. Report complete sieve analyses regardless of specified control sieves from largest particle through No. 200 sieve.
2. Plasticity of material passing No. 40 sieve.
3. Los Angeles abrasion wear of material retained on No. 4 sieve.
4. Clay lumps.
5. Lightweight pieces.
6. Organic impurities.

B. Production Testing. Provide reports to Owner’s Representative from an independent testing laboratory that backfill materials to be placed in Work meet applicable specification requirements.

C. Assist Owner's Representative in obtaining material samples for verification testing at source or at production plant.

PART 3 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.

B. Identify off-site sources for backfill materials at least 14 days ahead of intended use so that Owner's Representative may obtain samples for verification testing.

C. Materials may be subjected to inspection or additional verification testing after delivery. Materials which do not meet requirements of specifications will be rejected. Do not use material which, after approval, has become unsuitable for use due to segregation, mixing with other materials, or by contamination. Once material is approved by Owner's Representative, expense for sampling and testing required to change to different material will be credited to Owner through change order.

D. Bank run sand, select backfill, and random backfill, if available in project excavation, may be obtained by selective excavation and acceptance testing. Obtain additional quantities of these materials and other materials required to complete work from off-site sources.

E. Owner does not represent or guarantee that any soil found in excavation work will be suitable and acceptable as backfill material.

3.2 MATERIAL HANDLING

A. When backfill material is obtained from either commercial or non-commercial borrow pit, open pit to expose vertical faces of various strata for identification and selection of approved material to be used. Excavate selected material by vertical cuts extending through exposed strata to achieve uniformity in product.

B. Establish temporary stockpile locations for practical material handling, control, and verification testing by Owner's Representative in advance of final placement. Obtain approval from landowner for storage of backfill material on adjacent private property.

C. When stockpiling backfill material near project site, use appropriate covers to eliminate blowing of materials into adjacent areas and prevent runoff containing sediments from entering drainage system.

D. Place stockpiles in layers to avoid segregation of processed materials. Load material by making successive vertical cuts through entire depth of stockpile.

3.3 FIELD QUALITY CONTROL

A. Quality Control

1. The Owner’s Representative may sample and test backfill at:
   a. Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.
   b. On-site stockpiles.
   c. Materials placed in Work.
2. The Owner’s Representative may re-sample material at any stage of work or location if changes in characteristics are apparent.

B. Production Verification Testing: Owner's testing laboratory will provide verification testing on backfill materials, as directed by Owner’s Representative. Samples may be taken at source or at production plant, as applicable.

END OF SECTION 31 06 20.17

SECTION 31 11 00
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. Unit Prices.

1. Payment for clearing and grubbing is on per acre basis.
2. Refer to Division 1 for unit price procedures.

B. 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 E X E C U T I O N

2.1 PREPARATION

A. Verify that existing plant life and features designated to remain are identified and tagged.

2.2 PROTECTION

A. Protect following from damage or displacement:
1. Living trees located 3 feet or more outside of intersection of side slopes and original ground line.

2. Plants other than trees and landscape features designated to remain.
3. Utilities designated to remain.
4. Bench marks, monuments, and existing structures designated to remain.

2.3 CLEARING

A. Remove stumps, main root ball, and root system to:

1. Depth of 24 inches below finished subgrade elevation in area bounded by lines two feet behind back of curbs.
2. Depth of 24 inches below finished surface of required cross section for other areas.

B. Clear undergrowth and deadwood without disturbing subsoil.

C. Remove vegetation from top soil scheduled for reuse.

2.4 REMOVAL

A. Remove debris, rubbish, and extracted plant material life from site in accordance with requirements of Division 1.

B. Remove on site fences. Materials generated from removal of fences become property of Contractor. Properly dispose of in accordance with applicable local, state and federal laws.

END OF SECTION 31 11 00

SECTION 31 22 00
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.

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 bench marks survey, 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.

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.

D. Notify utility company to remove and relocate utilities.

3.3 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or degraded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Division 31 Specifications for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpile excavated subsoil on site.

C. Stockpiles: Use areas designated on site, pile depth not to exceed 8 feet (2.5 m); protect from erosion.

3.5 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove/Break-up soil clumps greater than 1” in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches (75 mm).

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

E. Place topsoil in areas where seeding is indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to the following compacted thicknesses:
   1. Areas to be Seeded with Grass: 6 inches (150 mm).
   2. Areas to be Sodded: 4 inches (100 mm).

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. Lightly compact placed topsoil.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot (30 mm) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 1/2 inch (13 mm).

3.7 FIELD QUALITY CONTROL

A. See Division 1 and Division 31 for compaction density testing.

3.8 CLEANING AND PROTECTION

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water. Excess topsoil and subsoil to be removed at no additional cost to owner.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 00

SECTION 31 23 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. Unit Prices:

1. Measurement for Trench Safety Systems used on trench excavations is on a linear foot basis measured along the centerline of the trench, including manholes and other line structures.
2. No payment will be made for Trench Safety Systems for structural excavations under this section. Include payment for Trench Safety System in applicable structure installation sections.
3. Refer to Division 1 for unit price procedures.

B. 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.

1.4 SUBMITTALS

A. Submittals shall conform to requirements of Division 1.

B. Submit a safety program specifically for the construction of trench excavation. Design the Trench Safety Program to be in accordance with OSHA 29 CFR standards governing the presence and activities of individuals working in and around trench excavations.

C. Construction and shop drawings containing deviations from OSHA standards or special designs shall be sealed by a licensed Engineer retained and paid by Contractor.

D. Review of the safety program by the Engineer will only be in regard to compliance with this specification and will not constitute approval by the Engineer nor relieve Contractor of obligations under State and Federal trench safety laws.

1.5 REGULATORY REQUIREMENTS

A. Install and maintain Trench Safety Systems in accordance with the detail specifications set out in the provision of Excavations, Trenching, and Shoring, Federal Occupation Safety and Health Administration (OSHA) Standards, 29 CFR, Part 1926, Subpart P, as amended, including Final Rule, published in the Federal Register Vol. 54, No. 209 on Tuesday, October 31, 1989. The sections that are incorporated into these specifications by reference include Sections 1926-650 through 1926-652.

B. The Contractor is responsible for obtaining a copy of OSHA standards included in "Subpart P - Excavations" from the Federal Register Vol. 54, No. 209.

C. Legislation that has been enacted by the Texas Legislature with regard to trench safety systems is hereby incorporated, by reference, into these specifications. Refer to Texas Health and Safety Code Ann., § 756.021 (Vernon 1991).

D. Reference materials, if developed for a specific project, will be issued with the Bid Documents.

1.6 INDEMNIFICATION

A. Contractor shall indemnify and hold harmless the Owner, its employees and agents, from any and all damages, costs (including, without limitation, legal fees, court costs, and the cost of investigation), judgements or claims by anyone for injury or death of persons resulting from the collapse or failure of trenches constructed under this Contract.

B. Contractor acknowledges and agrees that this indemnity provision provides indemnity for the Owner in case the Owner is negligent either by act or omission in providing for trench safety, including, but not limited to safety program and design reviews, inspections, failures to issue stop work orders, and the hiring of the Contractor.

PART 2 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 31 23 16.14

SECTION 31 23 33
TRENCHING AND BACKFILLING

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. Unit Prices.

1. No additional payment will be made for trench excavation, embedment and backfill under this Section. Include cost in unit price for installed underground piping, sewer, conduit, or duct work.
2. When Owner's Representative directs Contractor to over-excavate trench bottom, Contractor will be paid by unit price bid per linear foot under bid item - 6" Over-excavation of Trench Bottom.
    a. No payment will be paid if Owner's Representative does not direct Contractor to over-excavate trench bottom.
    b. No over-excavation will be measured or paid when unsuitable conditions result from dewatering system not in conformance with Division 1.
3. No additional payment will be made for performing Critical Location exploratory excavation. Include cost for unit price for work requiring critical location.
4. Refer to Division 1 for unit price procedures.

B. 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 planned typical method of excavation, backfill placement and compaction including:

1. Trench widths.
2. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction.
3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.

C. Submit backfill material sources and product quality information in accordance with requirements of Division 31.

D. Submit trench excavation safety program in accordance with requirements of Division 31. Include designs for special shoring meeting requirements defined in Paragraph 1.08, Special Shoring Design Requirements contained herein.

E. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.

F. Submit 11 inch by 17 inch or 12 inch by 18 inch copy of Drawing with plotted utility or obstruction location titled "Critical Location Report" to Owner’s Representative.

1.7 TESTS

A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by Owner in accordance with requirements of Division 1 and as specified in this Section.

B. Perform backfill material source qualification testing in accordance with requirements of Division 31.

1.8 SPECIAL SHORING DESIGN REQUIREMENTS

A. Have special shoring designed or selected by Contractor's Professional Engineer to provide support for sides of excavations, including soils and hydrostatic ground

water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a pre-manufactured system selected by Contractor's Professional Engineer to meet project site requirements based on manufacturer's standard design.

PART 2 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 1.08, Special Shoring Design Requirements.

2.2 MATERIAL CLASSIFICATIONS

A. Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Division 31.

B. Concrete Backfill: Conform to requirements for Class B concrete as specified in Division 31.

C. Geotextile (Filter Fabric): Conform to requirements of Division 1.

D. Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.

E. Timber Shoring Left in Place: Untreated oak.

PART 3 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.

C. Survey vertical and horizontal locations of obstructions relative to project baseline and datum and plot on 12 inch by 18 inch copy of Drawings. For large diameter water lines, submit to Owner's Representative for approval, horizontal and vertical alignment dimensions for connections to existing lines, tied into project baseline, signed and sealed by R.P.L.S.

3.4 PROTECTION

A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within grading limits as designated on Drawings, and in accordance with requirements of Division 1.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on Drawings.

D. Take measures to minimize erosion of trenches. Do not allow water to pond in trenches. Where slides, washouts, settlements, or areas with loss of density or pavement failures or potholes occur, repair, recompact, and pave those areas at no additional cost to the Owner.

3.5 EXCAVATION

A. Except as otherwise specified or shown on Drawings, install underground utilities in open cut trenches with vertical sides.

B. Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

C. Determine trench excavation widths using following schedule as related to pipe outside diameter (O.D.).

Nominal Pipe Size, Inches	Minimum Trench Width, Inches
Less than 18	O.D. + 24
18 to 30	O.D. + 24
36 to 42	O.D. + 36
Greater than 42	O.D. + 48

D. Use sufficient trench width or benches above embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.

E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify Owner's Representative and obtain instructions before proceeding.

F. Shoring of Trench Walls.

1. Install Special Shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.
2. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.
3. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by Owner's Representative. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and trench wall in vicinity of pipe zone.
4. Employ special methods for maintaining integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.
5. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent of 1-inch-thick steel plate. As sheeting is removed, fill in voids left with grouting material.

G. Use of Trench Shields. When trench shield (trench box) is used as worker safety device, the following requirements apply:

1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to trench sidewalls.
2. Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor degree of compaction reduced. Re-compact after shield is moved if soil is disturbed.
3. When required, place, spread, and compact pipe foundation and bedding materials beneath shield. For backfill above bedding, lift shield as each layer of backfill is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.
4. Maintain trench shield in position to allow sampling and testing to be performed in safe manner.
5. Conform to applicable 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 1 foot of Pipeline Company’s line. Do not use larger excavation equipment than normally used to dig trench in vicinity of pipeline until pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over pipelines unless approved by Pipeline Company’s representative.

K. When, during excavation to uncover pipeline company's pipelines, screwed collar or an oxy-acetylene weld is exposed, immediately notify Owner’s Representative. Provide supports for collar or welds. Discuss with Pipeline Company’s representative and determine methods of supporting collar or weld during excavation and later backfilling operations. When collar is exposed, request Pipeline Company to provide welder in a timely manner to weld ends of collar prior to backfilling of excavation.

3.6 HANDLING EXCAVATED MATERIALS

A. Use only excavated materials, which are suitable as defined in this Section and conforming to Division 31. Place material suitable for backfilling in stockpiles at distance from trench to prevent slides or cave-ins.

B. When required, provide additional backfill material conforming to requirements of Division 31.

C. Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect backfill material to be used on site. Maintain site conditions in accordance with Division 1. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

3.7 TRENCH FOUNDATION

A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.

B. When wet soil is encountered on trench bottom and dewatering system is not required, overexcavate an additional 6 inches with approval by Owner's Representative. Place non-woven geotextile fabric and then compact 12 inches of crushed stone in one lift on top of fabric. Compact crushed stone with four passes of vibratory-type compaction equipment.

C. Perform over excavation, if directed by Owner's Representative, in accordance with Paragraph 3.07B above. Removal of unstable or unsuitable material may be required if approved by Owner's Representative:

1. Even though Contractor has not determined material to be unsuitable, or
2. If unstable trench bottom is encountered and an adequate ground water control system is installed and operating according to Division 1.

D. Place trench dams in Class I foundations in line segments longer than 100 feet between manholes and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.8 PIPE EMBEDMENT, PLACEMENT, AND COMPACTION

A. Remove loose, sloughing, caving, or otherwise unsuitable soil from bottoms and sidewalls of trenches immediately prior to placement of embedment materials.

B. Place embedment including bedding, haunching, and initial backfill as shown on Drawings.

C. For pipe installation, manually spread embedment materials around pipe to provide uniform bearing and side support when compacted. Protect flexible pipe from damage during placing of pipe zone bedding material. Perform placement and

compaction directly against undisturbed soils in trench sidewalls, or against sheeting which is to remain in place.

D. Do not place trench shields or shoring within height of embedment zone unless means to maintain density of compacted embedment material are used. If moveable supports are used in embedment zone, lift supports incrementally to allow placement and compaction of material against undisturbed soil.

E. Place geotextile to prevent particle migration from in-situ soil into open-graded (Class I) embedment materials or drainage layers.

F. Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

G. Place haunching material manually around pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside pipe with sand bags or other suitable means.

H. Place electrical conduit, if used, directly on foundation without bedding.

I. Shovel in-place and compact embedment material using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping is not allowed.

J. For water lines construction embedment, use bank run sand, concrete sand, gem sand, pea gravel, or crushed limestone as specified in Division 31. For water lines adhere to the following subparagraph numbers 1 and 2; for utility installation other than water, adhere to numbers 3 and 4 below:

1. Class I, II and III Embedment Materials:
    a. Maximum 6 inches compacted lift thickness.
    b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.
    c. Moisture content to be within -3 percent to +5 percent of optimum as determined according to ASTM D 698, unless otherwise approved by Owner's Representative.
2. Cement Stabilized Sand (where required for special installations):
    a. Maximum 6 inches compacted thickness.
    b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.
    c. Moisture content to be on dry side of optimum as determined according to ASTM D 698 but sufficient for effective hydration.

3. Class I Embedment Materials.
    a. Maximum 6-inches compacted lift thickness.
    b. Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed pipe to meet deflection test criteria.
    c. Moisture content as determined by Contractor for effective compaction without softening soil of trench bottom, foundation or trench walls.
4. Class II Embedment and Cement Stabilized Sand.
    a. Maximum 6-inches compacted thickness.
    b. Compaction by methods determined by Contractor to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698 for Class II materials and according to ASTM D 558 for cement stabilized materials.
    c. Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on dry side of optimum as determined according to ASTM D 558 but sufficient for effective hydration.

K. Place trench dams in Class I embedment in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

3.9 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only minimum length of trench open as necessary for construction.

B. For water lines, backfill in trench zone, including auger pits, intermediate and site pits, with bank run sand, select fill, or random backfill material as specified in Division 31.

C. For sewer pipes, use backfill materials described by trench limits. For "trench zone backfill" under pavement and to within one foot back of curb, use cement stabilized sand to level 12 inches below the pavement. For sewer pipes under natural ground backfill from 12 inches above top of pipe to 6” inches below finish grade with suitable on-site material or select backfill. Use select backfill for rigid pavements or flexible base material for asphalt pavements for 12- inch backfill directly under pavement. Use topsoil for 6-inch backfill directly under natural grade. For backfill materials reference Division 31.

D. Where damage to completed pipe installation work is likely to result from withdrawal of sheeting, leave sheeting in place. Cut off sheeting 1.5 feet or more above crown of pipe. Remove trench supports within 5 feet from ground surface.

E. When shown on Drawings, random backfill of suitable material may be used in trench zone for trench excavations outside pavements.

F. Place trench zone backfill in lifts and compact. Fully compact each lift before placement of next lift.

1. Class I, II, III or IV or combination thereof (Random Backfill):
   a. Maximum 9-inches compacted lift thickness.
   b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 698.
   c. Moisture content within zero percent to +5 percent of optimum determined according to ASTM D 698, unless otherwise approved by Owner's Representative.

2. Cement-Stabilized Sand:
   a. Maximum lift thickness determined by Contractor to achieve uniform placement and required compaction, but do not exceed 12 inches.
   b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 558.
   c. Moisture content on dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.
3. Select Backfill:
   a. Place in maximum 8-inch loose layers.
   b. Compaction by equipment providing tamping or kneading impact to minimum of 95 percent of maximum dry density determined according to ASTM D 698.
   c. Moisture content within 2 percent below or 5 percent above optimum determined according to ASTM D 698, unless approved by Owner's Representative.

G. Unless otherwise shown on Drawings, for trench excavations not under pavement, random backfill of suitable material may be used in trench zone.

1. Fat clays (CH) may be used as trench zone backfill outside paved areas at Contractor's option. When required density is not achieved, at no additional cost to Owner, rework, dry out, use lime stabilization or other approved methods to achieve compaction requirements, or use different suitable material.
2. Maximum 9-inch compacted lift thickness for clayey soils and maximum 12-inch lift thickness for granular soils.
3. Compact to minimum of 90 percent of maximum dry density determined according to ASTM D 698.
4. Moisture content as necessary to achieve density.

H. For electric conduits, remove form work used for construction of conduits before placing trench zone backfill.

3.10 MANHOLES, INLETS, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

A. Meet requirements of adjoining utility installations for backfill of pipeline structures, as shown on Drawings.

B. Below paved areas, encapsulate structure with cement stabilized sand; minimum of 1 foot below base, minimum 2 foot around walls, up to within 12 inches of pavement subgrade. Compact in accordance with Paragraph 3.9.F.2 of this Section. Use select backfill for rigid pavements or flexible base material for asphalt pavements for 12-inch backfill directly under pavement.

C. In unpaved areas, encapsulate structure with cement stabilized sand; minimum of 1 foot below base, minimum 2 foot around walls, up to within 12 inches of finish grade. Compact in accordance with Paragraph 3.9.F.2 of this Section. Use suitable on-site material and topsoil for the 12-inch backfill directly under natural ground.

3.11 FIELD QUALITY CONTROL.

A. Test for material source qualifications as defined in Division 1.

B. Provide excavation and trench safety systems at locations and to depths required for testing and retesting during construction at no additional cost to Owner.

C. Tests will be performed on minimum of three different samples of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with Tex-101-E and Tex-110-E. Additional classification tests will be performed whenever there is noticeable change in material gradation or plasticity, or when requested by Owner's Representative.

D. At least three tests for moisture-density relationships will be performed initially for backfill materials in accordance with ASTM D 698, and for cement- stabilized sand in accordance with ASTM D 558. Perform additional moisture-density relationship tests once a month or whenever there is noticeable change in material gradation or plasticity.

E. In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at following frequencies and conditions.

1. For open cut construction projects and auger pits: Unless otherwise approved by Owner's Representative, successful compaction to be measured by one test per 40 linear feet measured along pipe for compacted embedment and two tests per 40 linear feet measured along pipe for compacted trench zone backfill material. Length of auger pits to be measured to arrive at 40 linear feet.
2. A minimum of three density tests for each full shift of Work.

3. Density tests will be distributed among placement areas. Placement areas are: foundation, bedding, haunching, initial backfill and trench zone.
4. The number of tests will be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.
5. Density tests may be performed at various depths below fill surface by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.
6. Two verification tests will be performed adjacent to in-place tests showing density less than acceptance criteria. Placement will be rejected unless both verification tests show acceptable results.
7. Recompacted placement will be retested at same frequency as first test series, including verification tests.
8. Identify elevation of test with respect to natural ground or pavement.

F. Recondition, recompact, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.

G. Acceptability of crushed rock compaction will be determined by inspection.

3.12 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess materials in accordance with requirements of Division 1.

END OF SECTION 31 23 33

SECTION 31 3116

TERMITE CONTROL

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Perform all work necessary and required for installation of termite protection. Such work includes all equipment and materials to provide termite protection below the S.O.G. and perimeter of building.

1.2 SUBMITTALS

A. Compliant with Section 01 3300.

B. Affidavit: Submit a signed affidavit immediately following application of termite treatment, verifying specification compliance of the chemicals, their proportions, and application.

C. Product Date: Design Mix, submit schedules, charts, literature, and illustrations to indicate the performance, fabrication procedures, product variations, and accessories.

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 years against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials and workmanship.
   01 Termite activity.
   02 Damage to and repair of building and building contents caused by termites.
   03 Re-treatment where required.

PART 2 – MATERIALS

A. Poison Diluent: Potable water

B. Solution Ration: Provide a minimum working strength of the following (by weight):
   01 “Termidor 80 wg” .125%.

C. Provide color additive for a visual indication of areas treated.

PART 3 – EXECUTION

3.1 APPLICATION

A. Quantities of Working solution
   01 Slab Area: 1 gallon per 10 square feet
   02 Perimeter, Slab Joints, and Penetrations: 4 gallons per 10 linear feet per foot of depth.

B. Procedures
   01 Notify the Owner before commencing work.
   02 Do not apply poison to soils that are wet or frozen
   03 Apply solution immediately prior to placing vapor barrier or waterproofing membrane.
   04 Re-apply solution if the area receives more than ¾ inches of rain before being fully covered. Re-apply solutions at all penetrations and perimeter if the area receives more than ½ inch of rain before placement of concrete.

END OF SECTION

SECTION 31 6600

SHALLOW SPREAD FOOTINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work Included: Perform all work necessary and required for the construction of the project as indicated. Such work includes, but is not necessarily limited to the furnishing and installing of spread footings as shown and noted on the drawings and specified herein, including the removal of all debris, patching of concrete walks, and backfilling.

B. Related Work in Other Sections: The following items of associated work are included in other sections of these specifications:

1. Cast-in-place concrete.

1.02 QUALITY CONTROL

A. Contractor's responsibility: Provide suitable access and lighting for Architect/Engineer and Owners representative to inspect the drilled pier excavations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. The design layout, construction and removal of debris shall be the sole responsibility of the Contractor.

B.

C. For estimating purposes, the base bid shall be based on spread footing depths as indicated on the structural drawings.

3.02 INSTALLATION

A. Excavation: Maintain spread footing centers throughout operation. Should spread footing excavation be carried below depth designated. Fill additional excavation with concrete as specified for the spread footings. No earth backfill will be allowed in footing excavations.

B. Cleaning: Keep underream base thoroughly clean and free of water before concrete is placed.

C. Reinforcement: Set in place reinforcement steel, which has already been tied. Maintain 3" minimum coverage of concrete.

END OF SECTION

SECTION 32 13 13
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. Unit Prices

1. Payment for concrete paving is on square yard basis. Separate pay items are used for each different required thickness of pavement.
2. Payment for concrete paving, high early strength, is on square yard basis.
3. Measurement for utility projects: Match actual pavement replaced but no greater than maximum pavement replacement limits shown on Drawings.
4. Refer to Division 1 for unit price procedures.
5. Refer to Paragraph 3.15, Unit Price Adjustment.

B. 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 flexural strength obtained from design mixes at required test ages.

C. Submit for approval manufacturer's description and characteristics for mixing equipment, and for traveling form paver, when proposed for use.

D. Submit manufacturer's certificates giving properties of reinforcing steel. Include certificate of compliance with ASTM A 82. Provide specimens for testing when required by Owner's Representative.

1.5 HANDLING AND STORAGE

A. Do not mix different classes of aggregate without written permission of Owner's Representative.

B. Class of aggregate being used may be changed before or during Work with written permission of Owner's Representative. Comply new class with specifications.

C. Reject segregated aggregate. Before using aggregate whose particles are separated by size, mix them uniformly to grading requirements.

D. Reject aggregates mixed with dirt, weeds, or foreign matter.

E. Do not dump or store aggregate in roadbed.

PART 2 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:

Percent by Weight of

Item	Total Sample Maximum
Clay lumps and friable particles	3.0
Material finer than 75-um (No. 200) sieve:	
Concrete subject to abrasion	3.0*
All other concrete	5.0*
Coal and lignite:	
Where surface appearance of concrete is of importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than 75-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 SUSTAINABLE PRODUCT REQUIREMENTS

A. Environmental Product Declaration (EPD)
   1. When available, provide qualified life cycle assessments or life cycle assessment action plans, industry-wide or product-specific EPDs, and third-party verified comparative analyses of environmental impact improvements.
      i. Preference is given to product-specific type III EPDs.

ii. Preference is given to third-party verified comparative analyses that demonstrate at least 10% reduction in GWP relative to the baseline.

B. Sourcing of Raw Materials
1. Recycled Content
a. When available, provide products with defined percentages of pre-consumer and/or post-consumer recycled content by weight.
b. Preference is given to products with maximum amount possible of post-consumer recycled content by weight.

2.3 EQUIPMENT

A. Conform Equipment to requirements of ASTM C 94.

2.4 MIXING

A. Flexural strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C78 (using simple beam with third-point loading). Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Determine and measure batch quantity of each ingredient, including water for batch designs and all concrete produced for Work. Mix shall conform to these specifications and other requirements indicated on Drawings.

B. Mix design to produce concrete which will have minimum compressive strength of 3,000 psi at 7 days and 3,500 psi at 28 days. Slump of concrete shall be at least 2 inches but no more than 5 inches, when tested in accordance with ASTM C 143.

1. Concrete pavement, including curb, curb and gutter, and saw-tooth curb, shall contain at least 5 1/2 sacks (94 pounds per sack) of cement per cubic yard, with not more than 6.5 gallons of water, net, per sack of cement (water-cement ratio maximum 0.57). Determine cement content in accordance with ASTM C 138. Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.
2. Coarse dry aggregate shall not exceed 85 percent of loose volume of concrete.
3. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be 4 1/2 percent plus or minus 1 1/2 percent. Determine air content by testing in accordance with ASTM C 231.
4. Use retardant when temperature exceeds 90 degrees F. Proportion as recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

C. Use high early strength concrete pavement to limits shown on Drawings. Design to meet following:

1. Concrete Mix: Flexural strength greater than or equal to 500 psi at 72 hours.
2. Cement: Minimum of 7 sacks of cement per cubic yard of concrete.
3. Water-Cement Ratio maximum of 0.45. Slump of concrete shall a maximum of 5 inches, when tested in accordance with ASTM C 143.
4. Other requirements for proportioning, mixing, execution, testing, etc., shall be in accordance with this Division 32.

PART 3 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 1 to 5 inches, except when using traveling-form paver, slump shall be maximum of 2 inches.

D. Deposit concrete continuously in successive batches. Distribute concrete in manner that will require as little rehandling as possible. Where hand spreading is necessary, distribute concrete with shovels or by other approved methods. Use only concrete rakes in handling concrete. At placement interruption of more than 30 minutes, place transverse construction joint at stopping point. Remove and replace sections less than 10 feet long.

E. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in edge of finished pavement will be cause for rejection.

3.8 COMPACTION

A. Consolidate concrete using mechanical vibrators as specified herein. Extend vibratory unit across pavement, not quite touching side forms. Space individual vibrators at close enough intervals to vibrate and consolidate entire width of pavement uniformly. Mount mechanical vibrators to avoid contact with forms, reinforcement, transverse or longitudinal joints.

B. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

3.9 FINISHING

A. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods. Hand finish with mechanical strike and tamping template in same width as pavement to be finished. Shape template to pavement section shown on Drawings. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make minimum of two trips over each area. Screed pavement surface to required section. Work screed with combined transverse and longitudinal motion in direction work is progressing. Maintain screed in contact with forms. Use longitudinal float to level surface.

B. On narrow strips and transitions, finish concrete pavement by hand. Thoroughly work concrete around reinforcement and embedded fixtures. Strike off concrete with strike-off screed. Move strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Tamp concrete with tamping template. Use longitudinal float to level surface.

C. After completion of straightedge operation, make first pass of burlap drag or transverse broom as soon as construction operations permit and before water sheen has disappeared from surface. Follow with as many passes as required to produce desired texture depth. Permit no unnecessary delays between passes. Keep drag wet, clean and free from encrusted mortar during use.

3.10 JOINTS AND JOINT SEALING

A. Conform to requirements of Division 32.

3.11 CONCRETE CURING

A. Conform to requirements of Division 32.

3.12 TOLERANCES

A. Test entire surface before initial set and correct irregularities or undulations. Bring surface within requirements of following test and then finish. Place 10 foot straightedge parallel to center of roadway to bridge depressions and touch high spots. Do not permit ordinates measured from face of straight edge to surface of pavement to exceed 1/16 inch per foot from nearest point of contact. Maximum ordinate with 10 foot straightedge shall not exceed 1/8 inch. Grind spots in excess of required tolerances to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

3.13 FIELD QUALITY CONTROL

A. Perform testing under provisions of Division 1.

B. Compressive Strength Test Specimens: Make four test specimens for compressive strength test in accordance with ASTM C 31 for each 150 cubic yards or less of pavement that is placed in one day. Test two specimens at 7 days or at number of hours as directed by the Owner's Representative for high early strength concrete. Test remaining two specimens at 28 days. Test specimens in accordance with ASTM C 39. Minimum compressive strength shall be 3000 pounds per square inch for first two specimens and 3500 pounds per square inch at 28 days.

C. When compressive test indicates failure, make yield test in accordance with ASTM C 138 for cement content per cubic yard of concrete. When cement content is found to be less than that specified per cubic yard, increase batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. Minimum of one 4 inch core will be taken at random locations per 375 feet per 12 feet lane or 500 square yards of pavement to measure in-place depth. Measure depth in accordance with ASTM C 174. Each core may be tested for 28 day compressive strength according to methods of ASTM C 42. 28-day compressive strength of each core tested shall be a minimum of 3000 pounds per square inch.

E. Request, at option, three additional cores in vicinity of cores indicating nonconforming in-place depths at no cost to Owner. In-place depth at these locations shall be an 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 choose to adjust 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 32 13 13

SECTION 32 13 13.25
CONCRETE SIDEWALKS

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Reinforced concrete sidewalks.

B. Wheelchair ramps.

C. Reinforced slope paving.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices

1. Payment for concrete sidewalks is on square foot basis.
2. No payment will be made for work outside these limits or in areas where driveway has been removed or replaced for Contractor's convenience.
3. Payment for wheelchair ramps of each type specified is on square foot basis. Removal and replacement of existing sidewalk, curb or curb and gutter and saw-cutting is paid by unit cost for each item. Sodding will be paid one foot on each side of sidewalk unless otherwise noted. Staining of wheelchair ramps is included in cost of ramp.
4. Refer to Division 1 for unit price procedures.

B. 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 31 - Standard Practice for Making and Curing Concrete Test Specimens in Field.

B. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

C. ASTM C 42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

E. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

F. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

G. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).

H. Texas Accessibility Standards of Architectural Barriers Act, Article 9102, Texas Civil Statues.

1.4 SUBMITTALS

A. Conform to requirements of Division 1.

B. Submit certified testing results and certificates of compliance.

PART 2 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 of Division 32. Use No. 3 reinforcing bars.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Division 32.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Division 31.

E. Forms: Use straight, unwrapped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. The use of 2-inch by 4-inch lumber as forms will not be allowed.

F. Sand Bed: Conform to material requirements for bank run sand of Division 31.

G. Sodding: Conform to material requirements for sodding of Division 31.

H. Coloring for wheelchair ramps: Conform to material requirements for colored concrete of Division 31. Color shall be Brick Red or as shown on the drawings.

2.2 SUSTAINABLE PRODUCT REQUIREMENTS

A. Environmental Product Declaration (EPD)
   1. When available, provide qualified life cycle assessments or life cycle assessment action plans, industry-wide or product-specific EPDs, and third-party verified comparative analyses of environmental impact improvements.

i. Preference is given to product-specific type III EPDs.
ii. Preference is given to third-party verified comparative analyses that demonstrate at least 10% reduction in GWP relative to the baseline.

B. Sourcing of Raw Materials
1. Recycled Content
a. When available, provide products with defined percentages of pre-consumer and/or post-consumer recycled content by weight.
b. Preference is given to products with maximum amount possible of post-consumer recycled content by weight.

PART 3 E X E C U T I O N

3.1 REPLACEMENT

A. Replace sidewalks and slope paving which are removed or damaged during construction with thickness and width equivalent to one removed or damaged, unless otherwise shown on Drawings. Finish surface (exposed aggregate, brick pavers, etc.) to match existing sidewalk.

B. Provide replaced and new sidewalks with wheelchair ramps when sidewalk intersects curb at street or driveway.

3.2 PREPARATION

A. Identify and protect utilities which are to remain.

B. Protect living trees, other plant growth, and features designated to remain.

C. Conduct clearing and grubbing operations in accordance with Division 31.

D. Excavate subgrade 6 inches beyond outside lines of sidewalk. Shape to line, grade and cross section. For soils with plasticity index above 40 percent, stabilize soil with lime in accordance with Division 31. Compact subgrade to minimum of 90 percent maximum dry density at optimum to 3 percent above optimum moisture content, as determined by ASTM D 698.

E. Immediately after subgrade is prepared, begin form work and concrete placement.

F. Spread 2 inch layer of bank sand under areas of proposed concrete sidewalk.

3.3 PLACEMENT

A. Setting Forms: Straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. Use of 2 by 4's as forms will not be

allowed. Securely stake forms to line and grade. Maintain position during concrete placement.

B. Reinforcement:

1. Install reinforcing bars.
2. Install reinforcing steel as shown on the drawings. Lay longitudinal bars in walk continuously, except through expansion joints.
3. Use sufficient number of chairs to support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.
4. Drill dowels into existing paving, sidewalk and driveways, secure with epoxy, and provide headers as required.
5. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1/12 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

C. Expansion Joints: Install expansion joints with load transfer units in accordance with Division 32.

D. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp, or other acceptable method. Bring mortar to surface.

E. Strike off to smooth finish with wood strike board. Finish smoothly with wood hand float. Brush across sidewalk lightly with fine-haired brush.

F. Apply coating to wheelchair ramp with contrasting color in accordance with Division 32.

G. Unless otherwise indicated on Drawings, mark off sidewalk joints 1/8 inch deep, at spacing equal to width of walk. Use joint tool equal in width to edging tool.

H. Finish edges with tool having 1/4 inch radius.

I. After concrete has set sufficiently, refill space along sides of sidewalk to one-inch from top of walk with suitable material. Tamp until firm and solid, place sod as applicable. Dispose of excess material in accordance with Division 1. Repair driveways and parking lots damaged by sidewalk excavation in accordance with Division 32.

3.4 CURING

A. Conform to requirements of Division 32.

3.5 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Division 1.

B. Compressive Strength Test Specimens: Four test specimens for compressive strength test will be made in accordance with ASTM C 31 for each 30 cubic yards or less of sidewalk that is placed in one day. Two specimens will be tested at 7 days. Remaining two specimens will be tested at 28 days. Specimens will be tested in accordance with ASTM C 39. Minimum compressive strength: 2500 psi at 7 days and 3000 psi at 28 days.

C. Yield test for cement content per cubic yard of concrete will be made in accordance with ASTM C 138. When cement content is found to be less than that specified per cubic yard, reduce batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. If the Contractor places concrete without notifying the laboratory, the Owner will have the concrete tested by means of core test as specified in ASTM C 42. When concrete does not meet specification, cost of test will be deducted from payment.

E. Sampling of fresh concrete shall be in accordance with ASTM C 172.

F. Take slump tests when cylinders are made and when concrete slump appears excessive.

G. Concrete shall be acceptable when average of two 28 day compression tests is equal to or greater than minimum 28 day strength specified.

H. If either of two tests on field samples is less than average of two tests by more than 10 percent, that entire test shall be considered erratic and not indicative of concrete strength. Core samples will be required of in-place concrete in question.

I. If 28 day laboratory test indicates that concrete of low strength has been placed, test concrete in question by taking cores as directed by Owner's Representative. Take and test at least three representative cores as specified in ASTM C 42 and deduct cost from payment due.

3.6 NONCONFORMING CONCRETE

A. Remove and replace areas that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. Replace nonconforming sections at no additional cost to Owner.

3.7 PROTECTION

A. Maintain newly place concrete in good condition until completion of Work.

B. Replace damaged areas.

END OF SECTION 32 13 13.25

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

PART 1 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. Unit Prices

1. Payment for street pavement expansion joints, with or without load transfer, is on linear foot basis.
2. Payment for horizontal dowels is on a unit price basis for each horizontal dowel.
3. No separate payment will be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in unit price for Concrete Paving.
4. No separate payment will be made for joints for Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter, Concrete Sidewalks, and Concrete Driveways.
5. Payment will be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).
6. Refer to Division 1 for unit price procedures.

B. 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 80 feet apart or as shown on the drawings. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.4 CONTRACTION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.5 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw cut. Seal groove with joint sealing compound.

3.6 SAWED JOINTS

A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until completed. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.

B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

3.7 JOINTS FOR CURB, CURB AND GUTTER

A. Place 3/4 inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement, at end of radius returns at street intersections and driveways, and at curb inlets. Maximum spacing shall be 120-foot centers.

3.8 JOINTS FOR CONCRETE SIDEWALKS

A. Provide 3/4 inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 40 feet.

3.9 JOINTS FOR CONCRETE DRIVEWAYS

A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.

B. Use joint sealing equipment in like new working condition throughout joint sealing operation, and be approved by Owner's Representative. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

A. Maintain joints in good condition until completion of Work.

B. Replace damaged joints material with new material as required by this Section.

END OF SECTION 32 13 73

SECTION 32 16 13
CURB 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. Unit Prices

1. Payment for curbs, curbs and gutter, and esplanade curbs is on linear foot basis measured along face of curb.
2. Payment for 3 foot concrete valley gutter is on a linear foot basis.
3. Payment for mountable concrete curbs is on a square foot basis.
4. Payment for concrete paving headers and concrete railroad headers is on a linear foot basis.
5. Payment for headers is on linear foot basis measured between lips of gutters adjacent to concrete base and measured between backs of curbs adjacent to concrete pavement.
6. Refer to Division 1 for unit price procedures.

B. 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, nonshrink grout containing no chloride producing agents conforming to following requirements.

1. Compressive strength
   a. at 7 days: 3500 psi
   b. at 28 days: 4000 psi
2. Initial set time: 45 minutes
3. Final set time: 1.5 hours

D. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Division 32.

E. Expansion Joint Filler: Conform to material requirements for expansion joint filler of Division 32.

F. Mortar: Mortar finish composed of one part Portland cement and 1 1/2 parts of fine aggregate. Use only when approved by Owner's Representative.

2.2 SUSTAINABLE PRODUCT REQUIREMENTS

A. Environmental Product Declaration (EPD)
   1. When available, provide qualified life cycle assessments or life cycle assessment action plans, industry-wide or product-specific EPDs, and third-party verified comparative analyses of environmental impact improvements.
      i. Preference is given to product-specific type III EPDs.
      ii. Preference is given to third-party verified comparative analyses that demonstrate at least 10% reduction in GWP relative to the baseline.

B. Sourcing of Raw Materials
   1. Recycled Content
      a. When available, provide products with defined percentages of pre-consumer and/or post-consumer recycled content by weight.
      b. Preference is given to products with maximum amount possible of post-consumer recycled content by weight.

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 Sec

SECTION 32 1816

PLAYGROUND SURFACING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Play safe surfacing for Playground

B. Cushion Pad

C. Border, Sub Base and other material required for a complete synthetic turf system

1.2 SUBMITTALS

A. Comply with Section 01 3300

B. Product Data:
- 01 Manufacturer's specifications and other data needed to prove compliance with the specified requirement.
- 03 Manufacturer's installation instructions.
- 04 Samples of color charts showing manufacturer's full range of colors.

1.3 WARRANTY

A. Provide 8-year warranty by the manufacturer against defects in materials and one year against defects in the workmanship from the Date of Substantial completion. Defect shall include, but not limited to, Ultraviolet ray fading, degradation or excessive wear of fiber.

B. Warranty shall be for full replacement of any damaged product within the warranty period.

PART 2 - PRODUCTS

2.1 TURF SYSTEM

A. Basis of design: "Robertson TotPlay 82 oz."

B. Cushion Layer: Polyethylene Foam Plank. 2" thick.

C. Infill: Blend of graded, silica sand

D. Sub-Base: Minimum 4" of different sizes of stone, uniformly mixed and wetted during mixing.

2.2 MANUFACTURER

A. Turf-Controlled Product distributed by Robertson Recreational Surfaces.

B. Foam Cushion- ProdTek- Product and Technical Services, Inc.

3.0 EXECUTION

3.1 INSTALLATION

A. Install Concrete border and Sub Base as shown. Minimum slope 2%; Tolerance: Slope 0.25" in any 10' direction and 0.125" in and 3' direction.

B. Compact stone base to 95% compaction.

C. Install cushion pad per manufacturer's instruction.

B. Install synthetic turf system in accordance with the manufacturer's written installation instructions.

B. Attach turf to the perimeter edge as per the manufacturer.

C. All seams shall be brushed thoroughly before infill materials are installed.

D. Install infill materials per manufacturer's instruction.

END OF SECTION

SECTION 32 3100

GATE OPERATORS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Electric Gate Operators

B. Accessories specified or required for a complete operation

1.2 REFERENCES

A. NEMA ICS 6

C. UL 325 and UL 991

D. OSO 9001

1.3 SUBMITTALS

A. Comply with Section 01 3300.

B. Product Data: Submit equipment system description, electrical wiring diagrams for installation and manufacturer's data sheets on each product to be used.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, edge conditions and accessories.

1.4 QUALITY ASSURANCE

A. Manufacture Qualifications: ISO 9001 Certified Manufacturer.

B. Installer Qualifications: Installation performed by factory authorized contractor specifically trained in gate operation systems of the type specified.

1.5 WARRANTY

A. Provide 5 years of warranty from substantial completion against deflects in materials, installation and operation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. LiftMaster

B. Platinum Access Systems

2.2 GATE OPEATORS

A. Design of Gate Operators is based on products manufactured by LiftMaster, Model CSL24UL.

B. Comply UL 325, UL 991 B csa c22.2 No. 247 Standards.

C. Comply with City of Houston Requirement.

D. Electrical Power Requirements: 230V single phase

E. Motor: 24V DC with soft start/stop operation and instant reversing. Duty Cycle: Continuous Duty.

F. Must be compatible with and directly connected to the building security/access control system to control and scheduling of gate.

G. Battery Back-up capable of cycling the gate a minimum of 100 times.

H. Solid state motor drivers.

I. Travel speed: nominally 12” per second.

J. Surge Protection.

K. Dual Output Loop Detector- signal to exit.

L. Chassis: Constructed with ¼” gold zinc-plated steel for rust prevention.

M. Quick Close, Anti-Tailgate: Secures property, preventing unauthorized access.

2.3 ACCESSORIES

A. Plug-in Loop Detector.

B. Provide a weatherproof UV-resistant polyethylene shell cover for each operator.

PART 3 - EXECUTION

A. Inspect and prepare substrates using the methods recommended by the manufacturer.

B. Install in accordance with manufacturer’s instructions. Test for proper operation and adjust until satisfactory results are obtained.

C. Mount operators on a minimum 4” thick concrete slab, sized as recommended by te Manufacturer.

D.

E. Protect installed products until Substantial Completion of the Project.

F. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 32 3113

CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Chain link fence, gates and accessories for a complete installation.

1.2 REFERENCES

A. American Society for Testing Materials:
   01 ASTM A120-78
   02 A153-78 (Galvanizing)

B. "Industrial Steel Specifications for Fence Posts, Gates and Accessories" by Chain Link Fence Manufacturers Institute.

1.3 SUBMITTALS

A. Shop Drawings: Indicate size, material, and finish, show locations and installation procedures. Include details of joints, attachments and clearances.

B. Product Data: Submit schedules, charts, literature, and illustrations indicating the performance, fabrication procedures, product variations and accessories.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain Link Fabric:
   01 Diamond mesh (2 inch), helically-woven and inter-woven
   02 9 gauge copper bearing steel wire hot dip galvanized. Gauge does not include PVC coating.
   03 Twisted and barbed (double knuckle) finished at top and bottom selvages (no exposed barbs)
   04 Wire Tensile Strength: 70,000 psi

B. Framing:
   01 All components hot dip galvanized
      a. Line posts 2-5/8 inch o.d. for 4 foot and 6 foot fence, and 2-7/8 inch o.d. for 7'-10', 3 inch o.d. for 12 foot fence, and 4 inch o.d. for tennis court practice back boards fence, schedule 40 pipe
      b. Terminal and pull posts are typically 3 inch o.d. schedule 40 pipe with conical tops.
      c. Softball Backstop Posts: Galvanized 6-5/8 inch o.d. (18.97 pounds per foot) for ends, and 4 inch o.d. (9.11 pounds per foot) elsewhere, unless shown otherwise on drawings. Provide three (3) 1-5/8 inch o.d. horizontal rails (top and bottom, and 1 intermediate) shall be 12'-0" high.

C. Top Rail:
   01 For 6 and 8 foot Fences: 1-5/8 inch, schedule 40 continuous top rail.
   02 Attach to fabric at 18 inch intervals with 9 gauge tie wire.

D. Mid Rails and Truss Braces:

01 Provide 1-5/8 inch o.d. schedule 40 mid rails at no greater than 6'-0" o.c. vertically and at the base of fences over 6 feet tall. Provide 5/16 inch truss rod and turnbuckle between terminal posts and adjacent posts.

E. Tension Bars:
01 Attach to post with clips for securing fabric to posts.

F. Swing Gates: ASTM F900
01 General: Gate frames shall be constructed of 2 inch round steel tubing of the sizes listed in chart below. Gate 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. 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.
02 Single leaf 3 ft.: 2-1/4 inch o.d. 4.1 pounds per foot, ASTM A120, galvanized schedule 50 pipe or 2-1/2 inch X 2-1/2 inch roll section, ASTM A501, hot dipped galvanized.
03 Single leaf 10 ft. or double leaf 20 ft.: 4 inch o.d. 9.11 pounds per foot, ASTM A120, galvanized schedule 50 pipe or 3" x 3" roll section, ASTM A501.

PART 3 - EXECUTION

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 9 inch diameter concrete post a minimum of 24 inches with a 3 inch concrete cover at the bottom.
02 All end, corner, and pull posts shall be set in concrete piers, a minimum of 12 inches in diameter, with a minimum of 36 inch post embedment in concrete, with an additional 3 inch concrete cover at bottom (typically). Tennis court piers shall be 16 inch diameter and 48 inches deep with 3 inch cover, (3) #3 reinforcing bars vertically and #3 reinforcing stirrups at 24 inches o.c. Baseball post piers shall be 6'-0" deep (+3 inch bottom cover), 18 inch diameter and be reinforced with (4) #3 verticals and #3 stirrups at 24 inches o.c.
03 All concrete shall be 3,000 psi minimum (28 days)

C. Install 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. Tie fabric to top rail with 9 gauge tie wires, spacing not to exceed 24 inches.
03 Stretch 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 inches on center.

D. Gates (Swing): Install plumb and level. Adjust hardware for smooth operation.

END OF SECTION

SECTION 32 8400

PLANTING IRRIGATION

PART 1 - GENERAL

1.10 SUMMARY:

A. This Section includes the measures to provide and install a complete, working irrigation system.

B. Related Sections:

1. SECTION 32 9200 – Sodding and Hydromulch.

2. SECTION 32 9300 – Planting.

3. SECTION 32 9500 – Landscape Warranty and Maintenance.

1.20 SUBMITTALS:

A. Provide product data, technical information, and operation manuals for each item listed in 'Part 2- Products' of this Section.

B. As Built Drawings: If installed irrigation system varies from the Drawings, provide 'As Built Drawings.' Contractor shall request digital or reproducible drawings from Landscape Architect as a base to prepare the drawings. Drawings shall be due to Owner's Representative prior to the end of the maintenance period. Drawings shall illustrate the locations, sizes, and types of main and lateral lines, valves and sprinklers, and equipment including backflow preventer, controller, and rain sensor.

C. Irrigation Diagram and Schedule: Provide two (2) color-coded diagrams with clearly identifiable valve numbers / stations, wire color, and valve size. Provide a schedule indicating the start time, duration, and sequence of each valve or station on the system and the amount of precipitation to be produced. One (1) copy shall be stored inside the controller door within a weather proof container. One (1) copy shall be due to Owner's Representative prior to the end of the maintenance period.

D. Extra Materials: Furnish extra materials as listed below. Each item shall be packaged with protective covering for storage and clearly labeled appropriately.

1. Spray Heads: Provide each type and size as shown on the Drawings equal to five percent of the amount installed. Provide at least two (2) of each unit.

2. Quick Couplers: Provide four (4) keys for quick couplers.

1.30 QUALITY ASSURANCE:

A. Source Limitations: Obtain all equipment and system components from the following manufacturers as per the Drawings.

1. Rain Bird Corporation: Phone: 520-741-6100. Website: www.rainbird.com.

2. FEBCO: Phone: 559-441-5300. Website: www.febcoonline.com.

3. Carson Industries LLC: Phone: 1-800-735-5566. Website: www.carsonind.com.

B. Experience: Contractor shall be a licensed irrigator in the state of Texas and have five (5) years minimum experience with irrigation design and installation similar to the Work. A full-time Field Supervisor shall be present when installation is in progress.

C. Pre-Construction Meeting: Before irrigation operations begin, Contractor shall meet with representatives of authorities having jurisdiction, Owner, Architect, Landscape Architect, consultants, and / or other concerned entities to review irrigation procedures and responsibilities.

1.40 DELIVERY, HANDLING, AND STORAGE:

A. Material shall be stored in unopened clearly marked manufacture's packaging until time of installation.

B. Piping: Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent damage to the ends and to prevent entrance of dirt, debris, and moisture.

C. Storage: Store all materials protected from direct sunlight. Support to prevent sagging and bending. Contractor shall be responsible for all stored materials.

1.50 PROJECT CONDITIONS:

A. Coordinate with other Trades: Install irrigation system after final grades have been established and the irrigation and planting area layouts has been approved by the Owner's Representative or Landscape Architect.

B. Cold Weather Protection: Do not excavate or install irrigation components upon frozen subgrade. Install system in dry weather and avoid freezing or frost-like conditions.

C. Existing Conditions: Examine areas to receive irrigation for conditions affecting installation and performance. Notify Owner's Representative if actual site conditions differ greatly from the Drawings. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Water Service: Notify Owner's Representative and obtain written approval if water service to Owner's facility will be turned off.

E. Existing Utilities: Contractor shall be responsible for any damage to existing utilities and structures.

F. Pollution Control: Comply with governing authorities and control pollutants as caused by the progress of the Work which include, but are not limited to, dust and run-off.

G. Security: Contractor shall be responsible for equipment and materials during course of the Work.

PART 2 - PRODUCTS

2.10 SYSTEM COMPONENTS:

A. Main Line: Main line is the pressurized piping from the water source to the control valves, size as per the Drawings.

1. Main Line shall be ASTM D 1785, PVC 1120 compound, Schedule 40.

2. PVC Socket Fittings, Schedule 40: ASTM D 2466.

3. Use Rector Seal Liquid Teflon available from Rector Seal Corporation with manufacturer's recommended primer for sealant for threaded joints.

B. Exposed Main Line: Main line installed above ground shall be ASTM B 88, Type K copper tubing with required pressure fitting and unions, size as per the Drawings.

C. Lateral Lines: Lateral lines are the non-pressurized piping from the control valves to the spray heads, size per the Drawings.

1. ½" size shall be Class 315 PVC.

2. ¾" and larger size shall be Class 200 PVC.

3. Welding Solvent: Use Christy's Red Hot Blue Glue available from T. Christy Enterprises with manufacturer's recommended primer for solvent welded joints.

4. Threaded Joints. Joints shall be ASTM D 2466, PVC, Schedule 80.

D. Sleeves: Protective pipe installed under paving shall be ASTM D, PVC Schedule 40, size as per the Drawings.

E. Gate Valves: Gate valves shall be #200-PRV, available from Rain Bird.

F. Quick Couplers: Quick couplers shall be #33DRC, available from Rain Bird.

G. Controller: Controller shall be #ESP-LXME, available from Rain Bird, refer to the Drawings for number of stations.

H. Rain Sensor: Rain sensor shall be #WR2, available from Rain Bird.

2.20 SPRAY HEAD COMPONENTS:

A. Remote Control Valves: Remote control valves shall be Rain Bird PGA Series, refer to Drawings for size. Attach an engraved, waterproof plastic tag to identify the number of each valve on the system.

B. Valve Boxes: Valve boxes shall be twelve (12) inch standard, black, #1419-12 body with #1419-3 flush cover available from Carson Industries, or approved equal, unless otherwise noted on the Drawings.

C. Spray Heads: Spray heads shall be #1800-PRS Series with MPR nozzles, available from Rain Bird, refer to the Drawings for size.

2.40 WIRING:

A. Wiring: Wiring shall be UL 493, Type UF-B multi-conductor, with solid-copper conductors and insulated cable suitable for direct burial. Wire shall be No. 12 AWG minimum located between building and controllers and for lengths over 1,000 feet.

B. Color-Coded Wiring: Color-coded wiring shall be No. 14 AWG minimum located between the controller and remote control valves. Color-coded wiring shall be used to differentiate between remote control valves / zones.

C. Green Wire: Common ground wire shall be green. Do not use green wire for any other purpose.

D. Splice Boxes: Splice boxes shall be 10 inch diameter, standard, and black, #910 L Series with flush cover available from Carson Industries or approved equal.

PART 3 - EXECUTION

3.10 EXAMINATION:

A. Design per the Drawings is approximate. Make minor adjustments necessary to avoid existing site conditions and existing site amenities. Maintain 100 percent even water coverage of all lawn and planting areas as indicated.

3.20 EARTHWORK:

A. Protect Existing Plant Material: Carefully remove and replant existing plants as required. Replace damaged plants with new material equal to species, size, and character to restore existing conditions.

B. Protect Existing Lawns: Carefully cut straight sod strips as required. Keep sod moist and immediately replace after piping is installed. Roll disturbed sod areas flat and water generously to restore existing character and quality.

C. Excavation: Excavate trenches for piping straight and true without humps or depressions. Bottom of trenches shall slope slightly to selected low points / drain pockets.

D. Install piping and wiring in sleeves under paving. If sleeves are not present on site, install sleeves by boring or jacking under existing paving.

E. Back Fill: Back fill with clean material from excavation after Owner's Representative has approved system. Remove debris and stones larger than one (1) inch in diameter. Place backfill in six (6) inch layers and compact to eliminate voids and air pockets.

3.30 PIPING INSTALLATION:

A. Keep piping clean. Cut pipe square and debur edge. Clean pipe and fittings with primers as per manufacturer's instructions immediately before installation. Apply thin layer of solvent cement inside fittings to create watertight joints. Allow joints to cure at least 24 hours or as per manufacture's recommendation before adding pressure to the system.

B. Main Line: Provide minimum depth of 18 inches below finished grade, or not less than 18 inches below average local frost depth, whichever is deeper. Install warning tape directly above pressure piping, 12 inches below finished grades and six (6) inches below paving.

C. Lateral Lines: Provide minimum depth of 12 inches below finished grade.

D. Install groups of pipes on solid subgrade parallel to each other, side by side. Piping shall be free of sags and bends.

3.40 VALVE INSTALLATION:

A. Valves: Adjust valves to provide adequate flow rate and operating pressure required for each irrigation zone.

1. Locate valves in groups, two (2) per valve box where possible, and in areas that are accessible for ease of maintenance, but areas that do not hinder the landscape design.

2. Attach identification tag to valves in clockwise order beginning at the backflow preventer.

B. Valve Boxes: Install all valves in valve boxes with top flush with grade.

1. Install three (3) inch minimum depth of drainage gravel in bottom of box.

2. Set box level on four (4) bricks for support.

3.50 SPRAY HEAD INSTALLATION:

A. Clean Lateral Lines: Flush lateral piping with water and immediately install spray heads. Set spray heads at manufacturer's recommended heights and plumb so that top of spray head will be flush with top of finish grade.

B. Spray Head Location: Adjust the locations of spray heads to create 100 percent even coverage and minimize over spray onto adjacent walks, roadways, and structures. Spray heads shall be plumb and flush with a maximum of ½" above top of mulch or finish grade. Minimum distances from paving areas and structures are as follows:

1. Four (4) inches perpendicular from walks and walls.

2. Six (6) inches perpendicular from back of curb at driveways, roadways, and parking lots.

3. Two (2) inches perpendicular from all other objects, unless otherwise indicated.

C. Spray Head Types: Pop-up spray heights are as follows:

1. Four (4) inch pop-up spray heads shall be located in lawn areas.

2. Twelve (12) inch pop-up spray heads shall be located in planting beds / planting areas.

3.60 EQUIPMENT INSTALLATION:

A. Controller: Controller shall be fully grounded. Provide 120 VAC to controller from Owner's existing power source. Follow local governing codes in electrical work. Connect each remote control valves to controller in a systematic, clockwise order.

B. Install wall mounted controller in approved location by Owner's Representative.

C. Install wiring in same trench as irrigation piping and at least two (2) inches beside the piping. Install wiring in separate sleeve under paving areas if irrigation piping is installed in sleeve.

1. Install splice boxes to cover all wire splices.

a. Install three (3) inch minimum depth of drainage gravel in bottom of box.

b. Set box level on four (4) bricks for support.

2. Provide looped slack in wire at valves, corners, and sleeves.

3. Tie wires in bundles in ten (10) foot intervals.

3.70 FIELD QUALITY CONTROL:

A. Main Line Pressure: Keep main line free of pressure when Contractor is not on site until the Contractor has proved the line is stable and free of leakages.

B. Testing of the System: Before backfilling, test the system for leaks by charging system at least 100 psi for one (1) hour. Repair piping and retest as needed until no leaks exist.

C. Testing Layout: Test each remote control valve / zone to ensure layout of spray heads meets coverage requirements. Adjust spray heads and retest as needed.

D. After Backfilling, label the locations of the lines to aid the installation of plant material.

E. Spray Heads: After the installation of all plant materials, adjust the height of the spray heads to be flush with, or not more than one half (1/2) inch above, finish grade.

F. Controller: Adjust controller settings for remote control valves to provide adequate watering to each zone.

3.90 TESTING AND APPROVAL:

A. Substantial Completion: Coordinate with planting installer to notify Owner's Representative or Landscape Architect upon completion of the irrigation Work to schedule a Substantial Complete Walkthrough.

B. Substantial Completion Walkthrough: Contractor, Owner's Representative and / or Landscape Architect shall inspect finished Work for items that do not comply with the Drawings or Specifications. Items shall be noted in a punch list for completion or correction by the Contractor.

C. Substantial Completion Notice: Upon completion of punch list items, Contractor shall be granted a Substantial Completion Notice, which signifies the beginning of the maintenance and warranty period.

3.10 WARRANTY AND MAINTEANCE:

A. Refer to SECTION 32 9500 – Landscape Warranty and Maintenance.

B. Warranty Period: Warranty period shall begin upon the receipt of Substantial Completion Notice and shall continue for a period of one (1) year.

C. Maintenance Period: Maintenance period shall begin immediately upon starting any of the Work and continue for a period of sixty (60) days beyond the receipt of Substantial Completion Notice of the Work or until Final Acceptance by the Owner.

3.11 CLEANUP AND PROTECTION:

A. Keep adjacent paving and construction areas clean during the course of the Work.

B. Sweep site and remove trash daily or as required.

C. Disposal: Remove excess materials including, but not limited to excess products, waste material, trash, and debris, and legally dispose off Owner's property.

END OF SECTION

SECTION 32 9200

SODDING AND HYDROMULCH

PART 1 - GENERAL

1.10 SUMMARY:

A. This section includes the measures to provide and install sod and hydromulch.

B. Related Sections:

1. SECTION 32 8400 – Planting Irrigation.

2. SECTION 32 9300 – Planting.

3. SECTION 32 9500 – Landscape Warranty and Maintenance.

1.20 SUBMITTALS:

A. Provide samples and product data for each item listed in 'Part 2 – Products' of this section.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1.30 QUALITY ASSURANCE:

A. Refer to SECTION 32 93 00 – Planting.

B. Experience: Contractor shall have five (5) years minimum experience with seeding and hydromulching practices and installation similar to the Work.

1.40 DELIVERY, HANDLING, AND STORAGE:

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

B. Sod: Deliver sod in time for planting within twenty four (24) hours of harvesting. Protect sod from breakage and drying.

1.50 PROJECT CONDITIONS:

A. Refer to SECTION 32 93 00 – Planting.

B. Coordinate with other Trades: Install lawn after final grades have been established and irrigation and plants have been installed.

PART 2 - PRODUCTS

2.10 SOD:

A. Species: Sod shall be Bermudagrass (Cynodon dactylon). Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Prepared Soil Mix: Prepared soil mix shall be composed of topsoil, sharp sand, and enriched bark mulch mixed equally. Each part shall be frees of toxins, weeds, roots, seeds, plant material, clay,

stones large than one (1) inch in any diameter, and other harmful materials that may hinder plant growth and survivability.

1. Top Soil: Topsoil shall be fertile, natural loam, not excessively acidic or alkaline, obtain from well-drained site.

2. Sharp Sand: Sharp sand shall be course grade, construction, or brick sand. Silt sand is not acceptable.

3. Enriched Bark Mulch: Enriched bark mulch shall be organic, shredded hardwood mulch enriched with peat. Peat shall be decomposed peat moss or native peat.

2.20 HYDROMULCH:

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Species: Seed Species shall be Bermudagrass (Cynodon dactylon). Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed.

C. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

2.30 OTHER PRODUCTS:

A. Fertilizer: Fertilizer shall be EPA registered and approved, commercial grade, neutral character, uniform in composition, free flowing, and not caked from being exposed to humidity. Type shall be recommended by manufacturer for required application.

B. Herbicide and Insecticide: Herbicide and insecticides shall be EPA registered and approved, pre-emergent, uniform in composition, free flowing, and not caked from being exposed to humidity. Type shall be recommended by manufacturer for required application.

PART 3 - EXECUTION

3.10 EXAMINATION:

A. Examine areas to receive lawns for compliance with requirements and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.20 PREPARATION:

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations. Protect grade stakes set by others until directed to remove them.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.30 LAWN REPARATION:

A. Newly Graded Areas: Loosen subgrade to a minimum depth of two (2) inches. Remove stones larger than one (1) inch in any dimension, sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

B. Existing Areas: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.

2. Loosen surface soil to a depth of at least 4 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 2 inches of soil. Till soil to a homogeneous mixture of fine texture.

3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.

4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

C. Prepared Soil Mix: Spread approximately 1 inch of prepared soil mix over prepared subgrade and mix into top two (2) inches of loosened subgrade.

D. Finish Grading: Grade lawn areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future. All graded areas shall promote positive drainage.

E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not over water or create muddy soil.

3.40 SODDING:

A. Lay sod within twenty four (24) hours of harvesting.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod pieces to offset joints in adjacent courses. Avoid damage to subgrade during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work prepared soil mix into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

C. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two (2) anchors per sod strip to prevent slippage.

D. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of two (2) inches below sod.

3.50 HYDROMULCH:

A. Hydromulch: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch tackifier as required as per manufacture’s recommendations.

2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry as per manufacturer’s recommendations.

3.12 SATISFACTORY LAWNS:

A. Satisfactory Hydroseeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 95 percent over any 10 square foot area.

B. Satisfactory Sodded Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

C. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.15 TESTING AND APPROVAL:

A. Substantial Completion: Coordinate with planting installer to notify Owner's Representative and / or Landscape Architect upon completion of the planting Work to schedule a Substantial Complete Walkthrough.

B. Substantial Completion Walkthrough: Contractor, Owner's Representative and Landscape Architect shall inspect finished Work for items that do not comply with the Drawings or Specifications. Items shall be noted in a punch list for completion or correction by the Contractor.

C. Substantial Completion Notice: Upon completion of punch list items, Contractor shall be granted a Substantial Completion Notice, which signifies the beginning of the maintenance and warranty period.

3.16 WARRANTY AND MAINTETNACE:

A. Refer to SECTION – 32 9500 Landscape Warranty and Maintenance.

B. Warranty Period: Warranty period shall begin upon the receipt of Substantial Completion Notice and shall continue for a period of one (1) year.

C. Maintenance Period: Maintenance period shall begin immediately upon starting any portion of the Work and continue for a period of sixty (60) days beyond the receipt of Substantial Completion Notice or until Final Acceptance by the Owner.

3.17 CLEANUP AND PROTECTION:

A. Promptly remove soil and debris, created by lawn work, from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

C. If utilized, remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION

SECTION 32 9300

PLANTING

PART 1 - GENERAL

1.10 SUMMARY:

A. This section includes the measures to provide and install plant material with tree stabilization, edging, planting bed preparation, and mulch.

B. Related Sections:

1. SECTION 32 8400 – Planting Irrigation.

2. SECTION 32 9200 – Sodding and Hydromulch.

3. SECTION 32 9500 – Landscape Warranty and Maintenance.

1.20 SUBMITTALS:

A. Provide samples and product data for each item listed in 'Part-2 Products' of this Section.

B. Samples for Verification: Provide samples for each of the following:

1. Clearly marked zip lock plastic bags of topsoil, prepared soil mix, and mulch.

C. Planting Schedule: Provide schedule indicating anticipated planting dates for all plant material. Schedule shall reflect seasonal limitations and specific Work conditions. Refer to and coordinate with the installation of irrigation and lawns.

1.30 QUALITY ASSURANCE:

A. Experience: Contractor shall have successfully installed other landscape projects similar to the Work for a period not less than five (5) years. A full-time Field Supervisor shall be present when planting is in progress.

B. Topsoil and Prepared Soil Mix: Contractor shall be responsible for all planting mediums to ensure that they will support and not hinder plant growth.

C. Owner's Representative and / or Landscape Architect reserves the right to reject any plant material that does not comply with the Drawings or Specifications at any time during the course of the Work. Contractor shall remove and replace any rejected material at no additional cost to the Owner.

D. Source Limitation: Obtain plant material from a recognized nursery with respected horticultural practices to ensure each plant species is matching in size and character.

E. Existing Plant Material: If damaged during the course of Work, Contractor shall remove and replace any damaged material equal to size, species and character. If new plant material is not available, Contractor shall compensate Owner appropriately.

F. Substitutions: Provide written request to Owner's Representative and / or Landscape Architect for any plant substitutions. Contractor shall provide proof that the material in question is not available and suggest an alternate, available plant material for substitution.

G. Pre-Construction Meeting: Before planting operations begin, Contractor shall meet with representatives of authorities having jurisdiction, Owner, Architect, Landscape Architect, consultants, and / or other concerned entities to review planting procedures and responsibilities.

1.40 DELIVERY, HANDLING, AND STORAGE:

A. Provide protective covering for plants during delivery. Protect plants from sunscald and whipping. Keep moist until time of planting.

B. Protect the natural shape of all material; do not tie trees or shrubs in a manner that will compromise their natural characteristics. Do not prune trees and shrubs before delivery, unless otherwise indicated.

C. Immediately deliver and plant freshly dug material. Protect root systems and keep moist.

1.50 PROJECT CONDITIONS:

A. Weather Limitations: Check weather forecasts for conditions permitting planting operations. Avoid freezing and frost-like conditions. Do not plant material in frozen grounds. Proceed with planting only when weather conditions permit.

B. Existing Conditions: Examine areas to receive plants for conditions affecting installation and future plant growth. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Existing Utilities: Contractor shall be responsible for any damage to existing utilities and structures.

D. Pollution Control: Comply with governing authorities and control pollutants as caused by the progress of the Work which include, but are not limited to, dust and run-off.

E. Coordination with Other Trades: Prepare planting beds after final grades have been established and irrigation has been installed. Planting layout shall be approved by the Owner's Representative and / or Landscape Architect before the installation of any material.

F. Security: Contractor shall be responsible for equipment and materials during course of the Work.

G. Plant Survivability: Contractor shall be responsible for the survivability of all material.

PART 2 - PRODUCTS

2.10 PLANT MATERIAL:

A. Provide quantity, quality, size, and species of plant material as per the Drawings. All material shall be full, healthy, and free of diseases, insects, and injuries from improper storage and handling. Roots shall be well established but shall not encircle the container.

B. Measure the main body of tree or shrub for height and spread requirements; do not prune material to obtain required sizes. Caliper measurements shall be taken six (6) inches above the ground for trees up to four (4) inch caliper, and 12 inches above the ground for trees larger than four (4) inch caliper.

C. Plant Tags: Plant tags shall be water and weather proof displaying both common and scientific name.

2.20 SOILS AND MULCH:

A. Prepared Soil Mix: Prepared soil mix shall be composed of topsoil, sharp sand, and enriched bark mulch mixed equally. Each part shall be free of toxins, weeds, roots, seeds, plant material, clay, stones large than one (1) inch in any diameter, and other harmful materials that may hinder plant growth and survivability.

1. Top Soil: Topsoil shall be fertile, natural loam, not excessively acidic or alkaline and free of stones one (1) inch or larger in any dimension. Topsoil shall exclude roots, plants, sod, clay lumps, seeds, and other materials that may hinder plant growth and survivability. Obtain topsoil from naturally well-drained sites.

2. Sharp Sand: Sharp sand shall be course grade, construction, or brick sand. Silt sand is not acceptable.

3. Enriched Bark Mulch: Enriched bark mulch shall be organic, shredded hardwood mulch enriched with peat. Peat shall be decomposed peat moss or native peat.

B. Mulch: Mulch shall be organic, shredded hardwood mulch free from harmful materials and suitable as a top dressing of trees and shrubs. Mulch shall be dark brown in color.

2.30 FERTILIZER, HERBICIDES, AND INSECTICIDES:

A. Fertilizer: Fertilizer shall be EPA registered and approved, commercial grade, neutral character, uniform in composition, free flowing, and not caked from being exposed to humidity.

B. Herbicide: Herbicide shall be EPA registered and approved, pre-emergent, uniform in composition, free flowing, and not caked from being exposed to humidity. Type shall be recommended by manufacturer for required application.

C. Fire Ant Prevention: Insecticide shall be uniform in composition, free flowing, and not caked from being exposed to humidity.

2.40 TREE STABILIZATION MATERIALS:

A. Lodge Poles: Lodge poles shall be rough-sawn pine, free of knots, holes, deterioration, or other defects. Poles shall be two (2) inch diameter by eight (8) foot length with one (1) pointed end. Provide three (3) poles per tree.

B. Wire Cables: Wire cables shall be 3/16-inch diameter, galvanized-steel.

C. Rubber Hose: Rubber hose shall be one-half (1/2) diameter, reinforced, black rubber hose cut in lengths as required.

PART 3 - EXECUTION

3.10 EXAMINATION:

A. Examine areas to receive lawns for compliance with requirements and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.20 PREPARATION:

A. Schedule: Install plant material before the installation of lawns unless otherwise noted. If planting trees and shrubs after lawns, protect new and existing lawns and repair any resulting damage.

B. Plant Material: Stake locations of trees and outline areas for planting areas. Layout shall be approved by Owner's Representative and /or Landscape Architect before installation. Make minor adjustments as required.

C. Deliver plants to the site after planting areas have been established immediately prior to installation.

D. Protect site amenities, utilities, and existing plants from damage caused by planting operations. Contractor shall be responsible for existing conditions.

E. Obstructions: Notify Owner's Representative and / or Landscape Architect if unexpected rock subgrade or obstructions detrimental to trees or shrubs are encountered in excavations

F. Drainage: Notify Owner's Representative and / or Landscape Architect if subsoil conditions retain water or inhibit proper drainage.

3.30 PLANTING SHRUBS:

A. Excavate pit with smooth, vertical sides to a depth of four (4) inches. Dispose excavated material legally off Owner's property. Do not use excavated soil as backfill material or to create prepared soil mix.

B. Loosen subgrade to a minimum depth of two (2) inches. Remove stones, larger than one (1) inch in any dimension, sticks, roots, rubbish, and other harmful materials and legally dispose off Owner's property.

C. Fill approximately one-half (1/2) of the excavated area with prepared soil mix; do not compact. Mix thoroughly in top two (2) inches of loosened subgrade. Broadcast fertilizer and till into all planting areas as per manufacturer's recommendations.

D. Planting Shrubs: Carefully remove root ball from container and set plants plumb in planting area equally spaced as per the Drawings so that top of root ball is one (1) inches above adjacent final grades.

1. Place prepared soil mix around root ball in layers; pat surface to eliminate and air pockets.

2. Attach plant tag to identify at least two (2) of each plant species per planting area.

3. Water thoroughly and repeat watering until no more water is absorbed.

4. Broadcast herbicide over finished beds as per manufacturer's instructions.

E. Finish Grading: Add remaining layer of prepared soil mix to all planting areas. Rake planting areas to a smooth, uniform surface; remove ridges and fill in depressions to meet required finish grades. Elevation of prepared soil mix shall be two (2) inches higher than adjacent lawn areas and equal to adjacent paved areas.

F. Mulch: Apply a two (2) inch minimum layer of mulch over all planting areas. Do not place mulch within three (3) inches of stems.

G. Herbicide: Broadcast herbicide over mulched areas as per manufacturer's instructions. Gently rake tops of plants to remove product from foliage.

H. Fire Ant Prevention: Broadcast insecticide over all landscape areas and areas adjacent to walkways per manufacturer's instructions. Gently rake tops of plants to remove product from foliage.

3.40 PLANTING TREES:

A. Excavate pits with smooth, vertical sides. Leave bottom, center area slightly raised to create a pedestal to support the root ball and assist in drainage. Do not further disturb pedestal but scarify sides and bottom of pit. Size pit per tree as per the Drawings.

B. Fill pits with water to ensure pits will drain before installing trees and shrubs.

C. Planting Trees: Carefully remove root ball from container and set material plumb and in the center of pit with top of root ball two (2) inches above adjacent finish grades.

1. If material is balled and burlap, remove baskets and remove burlap from top one-third (1/3) of root ball. Do not remove burlap from under root ball.

2. Place prepared soil mix around root ball in layers; pat surface to eliminate and air pockets.

3. Water thoroughly when pit is approximately one-half (1/2) full. Repeat watering until no more water is absorbed.

4. Fill in remaining area in pit with prepared soil mix, tamping eliminate voids and air pockets.

5. Broadcast herbicide over finished beds as per manufacturer's instruction.

D. Finish Grading: Rake tree ring to a smooth, uniform surface; remove ridges and fill in depressions to meet required finish grades. Create a soil saucer around the base of the tree as per the Drawings.

E. Stabilize Trunk: Stabilize trunk with lodge poles and wire cable as per the Drawings. Protect each trunk or multi-stems with one-half (1/2) inch diameter, reinforced, black rubber hose cut in lengths placed over the wire cable as required per tree.

F. Mulch: Apply four (4) inch minimum layer of mulch over tree rings. Do not place mulch within six (6) inches of trunk. Maintain saucer at base of the tree.

G. Herbicide: Broadcast herbicide over mulched areas as per manufacturer's instructions.

3.50 TESTING AND APPROVAL:

A. Substantial Completion: Notify Owner's Representative and / or Landscape Architect upon completion of the planting Work to schedule a Substantial Complete Walkthrough.

B. Substantial Completion Walkthrough: Contractor, Owner's Representative and Landscape Architect shall inspect finished Work for items that do not comply with the Drawings or Specifications. Items shall be noted in a punch list for completion or correction by the Contractor.

C. Substantial Completion Notice: Upon completion of punch list items, Contractor shall be granted a Substantial Completion Notice, which signifies the beginning of the maintenance and warranty period.

3.60 WARRANTY AND MAINTETNACE:

A. Refer to SECTION – 32 9500 Landscape Warranty and Maintenance.

B. Warranty Period: Warranty period shall begin upon the receipt of Substantial Completion Notice and shall continue for a period of one (1) year.

C. Maintenance Period: Maintenance period shall begin immediately upon starting any portion of the Work and continue for a period of sixty (60) days beyond the receipt of Substantial Completion Notice or until Final Acceptance by the Owner.

3.70 CLEANUP AND PROTECTION:

A. Keep adjacent paving and construction areas clean during the course of the Work.

B. Sweep site and remove trash daily and as required.

C. Disposal: Remove excess materials including, but not limited to excess soil, waste material, trash, and debris, and legally dispose off Owner's property.

END OF SECTION

SECTION 32 9500

LANDSCAPE WARRANTY AND MAINTENANCE

PART 1 - GENERAL

1.10 SUMMARY:

A. Warranty: This section includes the measures to provide a written warranty for all landscape work.

B. Maintenance: This section includes the measures to provide a landscape maintenance schedule, procedures, and manuals.

C. Related Sections:

1. SECTION 32 8400 – Planting Irrigation.

2. SECTION 32 9200 – Sodding and Hydromulch.

3. SECTION 32 9300 – Planting.

1.20 SUBMITTALS:

A. Warranty Agreement: A written warranty agreement shall include the provisions that the Contractor shall meet to warranty the plant material, irrigation system, and installation. Warranty certificate shall be submitted to the Owner's Representative upon receiving Substantial Completion Notice. Warranty provisions shall include, but are not limited to, the following:

1. Irrigation information shall include:

a. Replace parts that have failed due to improper or faulty installation or programming.

2. Planting information shall include:

a. Replace declining or perished planting material due to improper installation or watering procedures.

b. Repair or replace tree stabilization devices where tress have fallen, blown, or have been pushed over

B. Maintenance Booklet: Typed maintenance booklet shall include recommended procedures for the maintenance of the irrigation system and plant material for a full calendar year. Booklet is due to Owner's Representative prior to end of the maintenance period. Maintenance provisions shall include, but are not limited to the following:

1. Irrigation information shall include:

a. Manufacturer's maintenance manuals and emergency operations for all valves, sprinklers, and controllers.

b. Zone schedules for seasonal variations.

2. Planting information shall include:

a. Trimming and pruning schedules and techniques.

b. Fertilization requirements.

1.30 QUALITY ASSURANCE:

A. Skilled employees of the landscape installer shall complete maintenance procedures.

B. Contractor shall perform maintenance procedures in accordance to all applicable codes, ordinances, laws, and regulations required by authorities having jurisdiction over such work.

C. Contractor shall furnish and provide all permits as required by authorities having jurisdiction over such work.

D. Meetings: Contractor shall meet with Owner's maintenance on-site maintenance personnel monthly and at the end of the maintenance period to review all procedures and to transfer other helpful information to ensure a smooth transition from the Contractor at Final Acceptance.

PART 2 - PRODUCTS

2.10 PLANT MATERIAL:

A. Plant Material: Provide quantity, quality, size, and species of plant material to replace those installed species, which have perished during the warranty and maintenance period.

B. Fertilizer and Herbicides: Provide fertilizer and herbicides as required per manufacture's recommendations.

C. Mulch: Mulch shall be organic, shredded hardwood mulch free from harmful materials and suitable as a top dressing of trees and shrubs. Mulch shall be dark brown in color.

2.20 IRRIGATION MATERIAL:

A. Irrigation Material: Provide type and size of spray heads and to replace those, which have been damaged during the warranty and maintenance period.

2.30 MAINTENANCE EQUIPMENT:

A. Obtain all equipment necessary to complete all maintenance procedures. This equipment includes, but is not limited to, lawn mowers, trenchers, edgers, blowers, line trimmers, hand pruners, rakes, brooms, and trash / debris collection and removal devices.

PART 3 - EXECUTION

3.10 SCHEDULE:

A. Site Visits: Contractor shall visit the site and complete maintenance procedures as follows:

1. Weekly during May, June, July, August, and September.

2. Bi-weekly during January, February, March, April, October, November, and December.

3. Contractor shall schedule additional visits as weather and conditions require.

B. Fire Ant Control: Control the infestation of fire ants in planting and lawn areas that are adjacent to walkways. Apply insecticide as per manufacturer's instructions.

3.20 WATERING AND REMOVAL OF EXCESS WATER:

A. Ensure that all areas are watered as necessary to keep all plant material in a thriving condition. A thriving condition is defined by plant material experiencing new growth and which do not have stress, insects, or disease.

B. If an irrigation system is installed and working, Contractor shall be responsible for areas not covered by the irrigation system and shall ensure that all covered areas are being watered appropriately.

C. If an irrigation system is not installed or is installed but not working, provide and maintain temporary piping, hoses, and lawn-watering equipment. Adhere to the following measures:

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.

2. Trees: Deep water all newly installed trees until they are established and thriving.

3. Planting Areas: Water all newly installed planting beds regularly to ensure they are established and thriving.

4. Lawn Areas: Water all sodded and hydromulched areas as required to prevent drying and to encourage a unified stand of the specified grasses.

D. Eliminating Excess Water: Pump or siphon excess water from soil in planting areas and tree pits as required.

3.30 PLANTING AREAS:

A. Weeding: Remove all weeds from planting areas and recultivate planting areas as required. Remove all grass that has migrated into the planting area.

B. Perished Plants: Remove and replace any perished plant material. Provide material and installation equal to those used in the original installation.

C. Mulch: Resurface and replace mulch where needed. Restore plant saucers at tree plantings as required.

D. Plant Stabilization: Restake, tighten, and repair plant stabilization devices. Adjust plant material to proper grades and / or proper upright position. Once material has been established, stabilizations devices shall be removed only with approval by Owner's Representative and / or Landscape Architect.

E. Insects and Disease: Inspect plant material for the presence of insects and plant fungi. If found, Contractor shall report it to the Owner's Representative and / or Landscape Architect. Apply insecticides as per manufacturer's instructions.

3.40 SOD AND HYDROMULCH:

A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations as required. Roll, regrade, and replant bare or eroded areas to produce a uniformly smooth lawn. Provide material and installation equal to those used in the original installation.

B. Mowing: Mow as required to maintain a one and one-half (1 ½) to two (2) inch blade height. Use mowers with sharp, properly adjusted cutting blades. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third (1/3) of grass height. Remove no more than one-third (1/3) of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

C. Edging: Lawn areas shall be edged along all walkways, foundations, and other structures.

D. Replace any eroded soils until the proper establishment of lawn areas.

E. Fertilizer: Apply fertilizer thirty (30) days after installation as needed. Apply pre manufacturer's recommendations.

3.50 IRRIGATION SYSTEM:

A. Controller: Adjust the cycle frequency and duration of each automated irrigation zone. Reset as necessary to allow for seasonal growing periods.

B. Main and Lateral Lines: Repair leaks in main and lateral lines as needed.

C. Spray Heads: Adjust spray heads for 100 percent full, even coverage and minimize over spray onto walks, roadways, and other structures. Adjust spray head so that they are plumb and so that tops of spray heads are flush with top of finish grade.

D. Repair and replace all other irrigation components to establish a complete working system.

3.60 TESTING AND APPROVAL:

A. Substantial Completion: Upon receipt of Substantial Completion Notice, continue all maintenance procedures and begin warranty periods.

B. Final Acceptance: At the end of the specified maintenance period, Contractor shall notify the Owner's Representative and /or Landscape Architect when the following items are complete and all Work is in compliance to the Drawings and these Specifications:

1. Warranty Agreement has been issued to the Owner's Representative.

2. Maintenance Booklet has been issued to the Owner's Representative.

3. Irrigation As-Built Drawings have been issued to the Owner's Representative.

4. Irrigation Diagram and Schedule has been issued to the Owner's Representative.

5. Contractor has preformed all maintenance procedures and abided by the given schedule of visits.

6. The irrigation system is in a fully operational condition.

7. All plant material is established and is in a thriving condition.

8. All lawn areas are established and is in a thriving condition.

9. Contractor has met with Owner's on-site maintenance personnel to transfer information and review all maintenance procedures.

C. Final Acceptance Notice: Upon inspection of the above preceding items by the Owner's Representative and / or Landscape Architect, Contractor shall be granted Final Acceptance. Upon the receipt of the Final Acceptance Notice Contractor shall be relieved of all maintenance responsibilities. Contractor shall continue warranty responsibilities until the end of the set warranty period.

3.70 CLEANUP AND PROTECTION:

A. Trash Removal: Pick-up and haul off any trash and debris found on the site.

B. Remove excess materials including, but not limited to excess soil, waste material, trash, and debris, and legally dispose off Owner's property.

END OF SECTION

SECTION 32 9500

LANDSCAPE WARRANTY AND MAINTENANCE

PART 1 - GENERAL

1.10 SUMMARY:

A. Warranty: This section includes the measures to provide a written warranty for all landscape work.

B. Maintenance: This section includes the measures to provide a landscape maintenance schedule, procedures, and manuals.

C. Related Sections:

1. SECTION 32 8400 – Planting Irrigation.

2. SECTION 32 9200 – Sodding and Hydromulch.

3. SECTION 32 9300 – Planting.

1.20 SUBMITTALS:

A. Warranty Agreement: A written warranty agreement shall include the provisions that the Contractor shall meet to warranty the plant material, irrigation system, and installation. Warranty certificate shall be submitted to the Owner's Representative upon receiving Substantial Completion Notice. Warranty provisions shall include, but are not limited to, the following:

1. Irrigation information shall include:

a. Replace parts that have failed due to improper or faulty installation or programming.

2. Planting information shall include:

a. Replace declining or perished planting material due to improper installation or watering procedures.

b. Repair or replace tree stabilization devices where tress have fallen, blown, or have been pushed over

B. Maintenance Booklet: Typed maintenance booklet shall include recommended procedures for the maintenance of the irrigation system and plant material for a full calendar year. Booklet is due to Owner's Representative prior to end of the maintenance period. Maintenance provisions shall include, but are not limited to the following:

1. Irrigation information shall include:

a. Manufacturer's maintenance manuals and emergency operations for all valves, sprinklers, and controllers.

b. Zone schedules for seasonal variations.

2. Planting information shall include:

a. Trimming and pruning schedules and techniques.

b. Fertilization requirements.

1.30 QUALITY ASSURANCE:

A. Skilled employees of the landscape installer shall complete maintenance procedures.

B. Contractor shall perform maintenance procedures in accordance to all applicable codes, ordinances, laws, and regulations required by authorities having jurisdiction over such work.

C. Contractor shall furnish and provide all permits as required by authorities having jurisdiction over such work.

D. Meetings: Contractor shall meet with Owner's maintenance on-site maintenance personnel monthly and at the end of the maintenance period to review all procedures and to transfer other helpful information to ensure a smooth transition from the Contractor at Final Acceptance.

PART 2 - PRODUCTS

2.10 PLANT MATERIAL:

A. Plant Material: Provide quantity, quality, size, and species of plant material to replace those installed species, which have perished during the warranty and maintenance period.

B. Fertilizer and Herbicides: Provide fertilizer and herbicides as required per manufacture's recommendations.

C. Mulch: Mulch shall be organic, shredded hardwood mulch free from harmful materials and suitable as a top dressing of trees and shrubs. Mulch shall be dark brown in color.

2.20 IRRIGATION MATERIAL:

A. Irrigation Material: Provide type and size of spray heads and to replace those, which have been damaged during the warranty and maintenance period.

2.30 MAINTENANCE EQUIPMENT:

A. Obtain all equipment necessary to complete all maintenance procedures. This equipment includes, but is not limited to, lawn mowers, trenchers, edgers, blowers, line trimmers, hand pruners, rakes, brooms, and trash / debris collection and removal devices.

PART 3 - EXECUTION

3.10 SCHEDULE:

A. Site Visits: Contractor shall visit the site and complete maintenance procedures as follows:

1. Weekly during May, June, July, August, and September.

2. Bi-weekly during January, February, March, April, October, November, and December.

3. Contractor shall schedule additional visits as weather and conditions require.

B. Fire Ant Control: Control the infestation of fire ants in planting and lawn areas that are adjacent to walkways. Apply insecticide as per manufacturer's instructions.

3.20 WATERING AND REMOVAL OF EXCESS WATER:

A. Ensure that all areas are watered as necessary to keep all plant material in a thriving condition. A thriving condition is defined by plant material experiencing new growth and which do not have stress, insects, or disease.

B. If an irrigation system is installed and working, Contractor shall be responsible for areas not covered by the irrigation system and shall ensure that all covered areas are being watered appropriately.

C. If an irrigation system is not installed or is installed but not working, provide and maintain temporary piping, hoses, and lawn-watering equipment. Adhere to the following measures:

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.

2. Trees: Deep water all newly installed trees until they are established and thriving.

3. Planting Areas: Water all newly installed planting beds regularly to ensure they are established and thriving.

4. Lawn Areas: Water all sodded and hydromulched areas as required to prevent drying and to encourage a unified stand of the specified grasses.

D. Eliminating Excess Water: Pump or siphon excess water from soil in planting areas and tree pits as required.

3.30 PLANTING AREAS:

A. Weeding: Remove all weeds from planting areas and recultivate planting areas as required. Remove all grass that has migrated into the planting area.

B. Perished Plants: Remove and replace any perished plant material. Provide material and installation equal to those used in the original installation.

C. Mulch: Resurface and replace mulch where needed. Restore plant saucers at tree plantings as required.

D. Plant Stabilization: Restake, tighten, and repair plant stabilization devices. Adjust plant material to proper grades and / or proper upright position. Once material has been established, stabilizations devices shall be removed only with approval by Owner's Representative and / or Landscape Architect.

E. Insects and Disease: Inspect plant material for the presence of insects and plant fungi. If found, Contractor shall report it to the Owner's Representative and / or Landscape Architect. Apply insecticides as per manufacturer's instructions.

3.40 SOD AND HYDROMULCH:

A. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations as required. Roll, regrade, and replant bare or eroded areas to produce a uniformly smooth lawn. Provide material and installation equal to those used in the original installation.

B. Mowing: Mow as required to maintain a one and one-half (1 ½) to two (2) inch blade height. Use mowers with sharp, properly adjusted cutting blades. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third (1/3) of grass height. Remove no more than one-third (1/3) of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

C. Edging: Lawn areas shall be edged along all walkways, foundations, and other structures.

D. Replace any eroded soils until the proper establishment of lawn areas.

E. Fertilizer: Apply fertilizer thirty (30) days after installation as needed. Apply pre manufacturer's recommendations.

3.50 IRRIGATION SYSTEM:

A. Controller: Adjust the cycle frequency and duration of each automated irrigation zone. Reset as necessary to allow for seasonal growing periods.

B. Main and Lateral Lines: Repair leaks in main and lateral lines as needed.

C. Spray Heads: Adjust spray heads for 100 percent full, even coverage and minimize over spray onto walks, roadways, and other structures. Adjust spray head so that they are plumb and so that tops of spray heads are flush with top of finish grade.

D. Repair and replace all other irrigation components to establish a complete working system.

3.60 TESTING AND APPROVAL:

A. Substantial Completion: Upon receipt of Substantial Completion Notice, continue all maintenance procedures and begin warranty periods.

B. Final Acceptance: At the end of the specified maintenance period, Contractor shall notify the Owner's Representative and /or Landscape Architect when the following items are complete and all Work is in compliance to the Drawings and these Specifications:

1. Warranty Agreement has been issued to the Owner's Representative.

2. Maintenance Booklet has been issued to the Owner's Representative.

3. Irrigation As-Built Drawings have been issued to the Owner's Representative.

4. Irrigation Diagram and Schedule has been issued to the Owner's Representative.

5. Contractor has preformed all maintenance procedures and abided by the given schedule of visits.

6. The irrigation system is in a fully operational condition.

7. All plant material is established and is in a thriving condition.

8. All lawn areas are established and is in a thriving condition.

9. Contractor has met with Owner's on-site maintenance personnel to transfer information and review all maintenance procedures.

C. Final Acceptance Notice: Upon inspection of the above preceding items by the Owner's Representative and / or Landscape Architect, Contractor shall be granted Final Acceptance. Upon the receipt of the Final Acceptance Notice Contractor shall be relieved of all maintenance responsibilities. Contractor shall continue warranty responsibilities until the end of the set warranty period.

3.70 CLEANUP AND PROTECTION:

A. Trash Removal: Pick-up and haul off any trash and debris found on the site.

B. Remove excess materials including, but not limited to excess soil, waste material, trash, and debris, and legally dispose off Owner's property.

END OF SECTION

SECTION 33 05 13
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. Unit Prices

1. Payment for normal depth manholes, up to 8 feet deep, is on a unit price basis for each manhole installed. Manhole depth is measured from top of cover to sewer invert. Air release manhole depth is measured from top of cover to inside base for air release or vacuum release manholes.
2. Payment for shallow depth manholes is on a unit price basis for each manhole installed. Shallow manholes have a depth of 5 feet or less measured from top of cover to sewer invert.
3. Payment for extra depth manholes is on a unit price basis per vertical foot for each foot of depth greater than 8 feet. Sewer manhole depth is measured from top of cover to sewer invert.
4. No separate payment for internal or external manhole drops.
5. Payment for pile-supported concrete foundation used for unstable subgrade treatment for manhole base is on a unit price basis for each foundation installed.
6. Refer to the provisions of Division 1 for unit price procedures.

B. 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 4000 psi.

C. Cement Stabilized Sand Foundation: Provide cement stabilized sand foundation under base section in lieu of foundation slab, as shown on Drawings, conforming to requirements of Division 31.

D. Concrete Foundation: Provide Class A concrete with minimum compressive strength of 4000 psi for concrete foundation slab under manhole base section where indicated on Drawings.

2.3 REINFORCING STEEL

A. Conform to requirements of Division 32.

2.4 MORTAR

A. Conform to requirements of City of Houston Standard Specifications Section 04061 – Mortar.

2.5 MISCELLANEOUS METALS

A. Provide cast-iron frames, rings, and covers conforming to requirements of Division 33.

2.6 DROP CONNECTIONS AND STUBS

A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on Drawings.

2.7 PIPE CONNECTIONS TO MANHOLE

A. Sanitary Sewers.

1. Provide resilient connectors conforming to requirements of ASTM C 923. Use the following materials for metallic mechanical devices as defined in ASTM C 923:
   a. External clamps: Type 304 stainless steel
   b. Internal, expandable clamps on standard manholes: Type 304 stainless steel, 11 gauge minimum.
   c. Internal, expandable clamps on corrosion-resistant manholes:
      1) Type 316 stainless steel, 11 gauge minimum
      2) Type 304 stainless steel, 11 gauge minimum, coated with minimum 16 mil fusion-bonded epoxy conforming to AWWA C 213
2. Where rigid joints between pipe and cast-in-place manhole base are specified or shown on Drawings, provide polyethylene-isoprene water-stop meeting physical property requirements of ASTM C 923, such as Press-Seal WS Series, or approved equal.

B. Storm Sewer Connections:

1. Provide watertight connections in accordance with ASTM C 923.

C. Water Lines

1. Where smooth exterior pipes, i.e., steel, ductile iron, or PVC pipes are connected to manhole base or barrel, seal space between pipe and manhole wall with assembly consisting of rubber gasket or links mechanically compressed to form a watertight barrier. Assemblies: Press-Wedge, Res-Seal, Thunderline Link-Seal, or approved equal. See Drawings for placement of assembly in manhole sections.
2. When connecting concrete or cement mortar coated steel pipes, or as option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of a stainless steel power sleeve, stainless steel take-up clamp and a rubber gasket. Take-up clamp: Minimum of 9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

2.8 SEALANT MATERIALS

A. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, Adeka Ultraseal P201, or approved equal.

B. Provide approved external sealing material from Canusa Wrapid Seal manhole encapsulation system, or approved equal.

C. Provide Butyl Sealant: Provide Press-Seal EZ Stick, or equal, for HDPE rings.

2.9 CORROSION RESISTANT MANHOLE MATERIALS

A. Where corrosion-resistant manholes or PVC-lined manholes are indicated on Drawings, provide one of following:

1. PVC liner for precast cylindrical manhole section, base sections, and cone sections in accordance with Division 33.
2. Precast base sections, as specified above, lined with PVC or equal and fiberglass manholes in accordance with Division 33.

2.10 BACKFILL MATERIALS

A. Conform to requirements of Division 31.

2.11 NON-SHRINK GROUT

A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only addition of water.

B. Meet requirements of ASTM C 1107 and have minimum 28-day compressive strength of 7000 psi.

2.12 VENT PIPES

A. Provide external vent pipes for manholes where indicated on Drawings.

B. Buried Vent Pipes: Provide 3 inch or 4 inch PVC DWV pipe conforming to ASTM D 2665. Alternatively, provide FRP pipe as specified for vent outlet assembly.

C. Vent Outlet Assembly: Provide vent outlet assembly as shown on Drawings, constructed of following specified materials:

1. FRP Pipe: Provide filament wound FRP conforming to ASTM D 2996 or centrifugally cast FRP conforming to ASTM D 2997. Seal cut ends in accordance with manufacturer's recommendations.
2. Joints and Fittings: Provide epoxy bodied fittings and join pipe to fittings with epoxy adhesive
3. Flanges: Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on Drawings. Meet bolt pattern and dimensions for ASME B 16.1, 125-pound flanges. Flange bolts shall be Type 304 stainless steel or hot-dip zinc coated, conforming to ASTM A 307, Class A or B.
4. Coating: Provide approved 2-component, aliphatic polyurethane coating using primer or tie coat recommended by manufacturer. Provide two or more coats to yield dry film thickness of at least 3 mils. Color shall be selected by The Engineer from manufacturer's standard colors.

2.13 PROHIBITED MATERIALS

A. Do not use brick masonry for construction of manholes, including adjustment of manholes to grade unless approved by the Engineer. Use only specified materials listed above.

2.14 MANHOLE LADDER FOR WATERLINE MANHOLES

A. Manhole Ladder: Fiberglass with 300-lb rating at appropriate length; conform to requirements of Occupational Safety and Health Standards (OSHA), U.S. Department of Labor except where shown on Drawings.

1. Use components, including rungs, made of fiberglass, fabricated with nylon or aluminum rivets and/or epoxy. Apply non-skid coating to ladder rungs. Mount ladder using manufacturer's recommended hardware.
2. Provide ladder as manufactured by Saf-Rail or approved equal. Locate ladder as shown on Drawings.
3. Fiberglass: Premium type polyester resin, reinforced with fiberglass; constructed to provide complete wetting of glass by resin; resistant to rot, fungi, bacterial growth and adverse effects of acids, alkalis and residential and industrial waste; yellow in color.
4. Provide approved petroleum-based tape encapsulating bolts in access manhole.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to 95 percent of maximum Standard Proctor Density according to ASTM D 698 prior to placement of foundation material and base section. When proper density is not reached, moisture condition subgrade until that density is reached or treat as unstable subgrade.

C. Do not build manholes in ditches, swales, or drainage paths unless approved by the Engineer.

3.2 PLACEMENT

A. Install precast manholes to conform to locations and dimensions shown on Drawings.

B. Place sanitary and storm manholes at points of change in alignment, grade, size, pipe intersections, and end of sewer unless otherwise shown on Drawings.

3.3 MANHOLE BASE SECTIONS AND FOUNDATIONS

A. Place precast base on 12 inch thick (minimum) foundation of crushed stone wrapped in filter fabric, cement stabilized sand, or concrete foundation slab. Compact cement-sand in accordance with requirements of Division 2.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify the Engineer for examination of subgrade to determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for 24 inch-thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base. When there is evidence of heaving, provide pile-supported concrete foundation, as detailed on Drawings, under manhole base.

3.4 PRECAST MANHOLE SECTIONS

A. Install sections, joints, and gaskets in accordance with manufacturer's printed recommendations.

B. Install precast adjustment rings above tops of cones or flat-top sections as required to adjust finished elevation and to support manhole frame.

C. Seal any lifting holes with non-shrink grout.

D. Where PVC liners are required, seal joints between sections in accordance with manufacturer's recommendations.

E. Place at least two precast concrete grade rings with thickness of 12 inches or less, under casting.

3.5 PIPE CONNECTIONS AT MANHOLES

A. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

1. Where smooth exterior pipes, i.e. steel, ductile iron or PVC pipes are connected to manhole base or barrel, space between pipe and manhole wall shall be sealed with an assembly consisting of rubber gaskets or links mechanically compressed to form watertight barrier. Assemblies: "Press-Wedge," "Res-Seal," "Thunderline Link-Seals," or approved equal. See Drawings for placement of assembly in manhole sections.
2. When connecting concrete or cement mortar coated steel pipes, or as an option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of stainless steel power sleeve, stainless steel take-up clamp and rubber gasket. Take-up clamp: Minimum of9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

B. Grout storm sewer connections to manhole unless otherwise shown on Drawings. Grout pipe penetration in place on both inside and outside of manhole.

C. Ensure no concrete, cement stabilized sand, fill, or other rigid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. If necessary, fill space with compressible material to ensure full flexibility provided by resilient connector.

D. Where new manhole is constructed on existing sewer, rigid joint pipe may be used. Install waterstop gasket around existing pipe at center of cast-in-place wall. Join ends of split waterstop material at pipe springline using an adhesive recommended and supplied by waterstop manufacturer.

E. Test connection for watertight seal before backfilling.

3.6 INVERTS FOR SANITARY SEWERS

A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:

1. Slope of invert bench: 1 inch per foot minimum; 1-1/ 2 inches per foot maximum
2. Depth of bench to invert:
    a. Pipes smaller than 15 inches: one-half of largest pipe diameter
    b. Pipes 15 to 24 inches: three-fourths of largest pipe diameter
    c. Pipes larger than 24 inches: equal to largest pipe diameter
3. Invert slope through manhole: 0.10 foot drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on Drawings.

B. Form invert channels with concrete if not integral with manhole base section. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

3.7 DROP CONNECTIONS FOR SANITARY SEWERS

A. Backfill drop assembly with crushed stone wrapped in filter fabric, cement stabilized sand, or Class A concrete to form solid mass. Extend cement stabilized sand or concrete encasement minimum of four (4) inches outside bells.

B. Install drop connection when sewer line enters manhole higher than 30 inches above invert of manhole.

3.8 STUBS FOR FUTURE CONNECTIONS

A. In manholes, where future connections are indicated on Drawings, install resilient connectors and pipe stubs with approved watertight plugs.

3.9 MANHOLE FRAME AND ADJUSTMENT RINGS

A. Combine precast concrete adjustment rings so elevation of installed casting cover matches pavement surface. Seal between concrete adjustment ring and precast top section with 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 6 inches above existing ground line unless otherwise indicated on Drawings. In unpaved areas, encase manhole frame in mortar or non-shrink grout placed flush with face of manhole ring and top edge of frame. Provide rounded comer around perimeter.

3.10 BACKFILL

A. Place and compact backfill materials in area of excavation surrounding manholes in accordance with requirements of Division 31. Provide embedment zone backfill material, as specified for adjacent utilities, from manhole foundation up to an elevation 12 inches over each pipe connected to manhole. Provide trench zone backfill, as specified for adjacent utilities, above embedment zone backfill.

B. Where rigid joints are used for connecting existing sewers to manhole, backfill under existing sewer up to springline of pipe with Class B concrete or flowable fill.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide minimum of 4 inches of topsoil conforming to requirements of Division 32. When shown on Drawings, sod disturbed areas in accordance with Division 32.

3.11 FIELD QUALITY CONTROL

A. Conduct leakage testing of sanitary sewer manholes in accordance with requirements of Division 33.

3.12 PROTECTION

A. Protect manholes from damage until work has been accepted. Repair damage to manholes at no additional cost to the Owner.

END OF SECTION 33 05 13

SECTION 33 05 13.13
MANHOLES AND STRUCTURES 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. Unit Prices.

1. No separate payment will be made for adjusting inlets and valve boxes to grade for new construction under this Section. Include payment in unit price for related item.
2. Payment for adjusting existing manhole and frame and cover to new grade is on a unit price basis for each manhole and frame and cover.
3. Payment for adjusting existing utility structures to grade is on unit price basis for each:
   a. Inlet adjusted
   b. Valve box adjusted
   c. Refer to Division 1 for unit price procedures.

B. 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 Manger.

3.2 ESTABLISHING GRADE

A. Coordinate grade related items with existing grade and finished grade or paving, and relate to established benchmark 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 Manger. 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 33 05 13.13

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. Unit Prices

1. Payment for inlets is on unit price basis for each inlet installed.
2. Payment for headwalls and wingwalls is on unit price basis for each headwall and wingwall installed.
3. Payment for junction box with lid or grate top is on unit price basis for each junction box installed.
4. Payment for inlets, headwalls, wingwalls, and junction boxes includes connection of lines and furnishing and installing frames, grates, rings, and covers.
5. Refer to Division 1 for unit price procedures.

B. 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 4,000 psi.

B. Reinforcing Steel: Place reinforcing steel to conform to details shown on Drawings and as follows:

1. Provide positive means for holding steel cages in place throughout production of concrete units. Maximum variation in reinforcement position is plus or minus 10 percent of wall thickness or plus or minus 1/2 inch, whichever is less. Regardless of variation, maintain minimum cover of concrete over reinforcement as shown on Drawings.
2. Welding of reinforcing steel is not permitted unless noted on Drawings.

C. Mortar and Hydraulic Cement: Conform to requirements of Division 32.

D. Miscellaneous Metal: Cast-iron frames and plates conforming to requirements of Division 33.

2.2 SOURCE QUALITY CONTROL

A. Tolerances: Allowable casting tolerances for concrete units are plus or minus 1/4 inch from dimensions shown on Drawings. Concrete thickness in excess of that required will not constitute cause for rejection provided that excess thickness does not interfere with proper jointing operations.

B. Precast Unit Identification: Mark date of manufacture and name or trademark of manufacturer clearly on inside of inlet, headwall, or wingwall.

C. Rejection: Precast units rejected for non-conformity with these specifications and for following reasons:

1. Fractures or cracks passing through shell, except for single end crack that does not exceed depth of joint.
2. Surface defects indicating honeycombed or open texture.
3. Damaged or misshaped ends, where damage would prevent making satisfactory joint.

D. Replacement: Immediately remove rejected units from Work site and replace with acceptable units.

E. Repairs: Occasional imperfections resulting from manufacture or accidental damage may be repaired if, in opinion of Owner's Representative, repaired units conform to requirements of these specifications.

PART 3 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 33 05 16.13

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. Unit Prices

1. No payment will be made for concrete for utility construction under this Section. Include cost in applicable utility structure.
2. Obtain services of and pay for certified testing laboratory to prepare design mixes.
3. Refer to Division 1 for unit price procedures.

B. 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.)		Miximum W/C Ratio	Air Content (Percent)	Consistency Range in Slump (Inches)
		7-Day	28-Day			
A	Structural	3200	4000	0.45	4 ± 1	2 to 4*
B	Pipe Block Fill, Thrust Block	---	1500	---	4 ± 1	5 to 7
*When ASTM C 494, Types F or Type G admixture is used to increase workability, this range may be 6 to 9.						

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.

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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 though 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Owner's Representative before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to site shall be accompanied by batch tickets providing information required by ASTM C 94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing information required by ASTM C 685, Section 14.

E. When adverse weather conditions affect quality of concrete, postpone concrete placement. Do not mix concrete when air temperature is at or below 40 degrees F and falling. Concrete may be mixed 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 City.

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.

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. Unit Prices.

1. No separate payment will be made for PVC pipe under this Section. Include cost in unit price for work included as specified Division 2.
2. Refer to Division 1 for unit price procedures.

B. 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 Certain Teed Diamond Uponor ETI North American	D3034	SDR 26 / PS 115	6" to 10"
		D3034	SDR 35 / PS 46	12" & 15"
		F679	SDR 35 / PS 46	18" to 27"
		AWWA C900	DR 18 / N/A	4" to 12"
		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 2.02E.

2.5 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

A. Bends and Fittings: ANSI A 21.10 or ANSI A 21.53, ductile iron; ANSI A 21.11 single rubber gasket push-on type joint; minimum 150 psi pressure rating. Approved restrained joints, 250 200 psi, may be provided for up to 12 inches in diameter (water or sanitary).

B. Provide approved restrained joint fittings: Integral restrained joint fittings and pipe do not require secondary restraint.

PART 3 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 33 06 10.14

SECTION 33 06 10.15
DUCTILE IRON PIPE AND FITTINGS

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Ductile iron pipe and fittings for water mains, wastewater force mains, gravity sanitary sewers, and storm sewers.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for ductile iron pipe and fittings under this Section, with the exception of extra fittings in place. Include cost in unit prices for work as specified in the following Sections, as applicable:

a. 33 11 00 - Water Utility Distribution Piping.
b. 33 31 00 – Sanitary Utility Sewerage Piping.
c. 33 41 00 - Storm Utility Drainage Piping.

B. 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.

1.03 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.

1.04 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.

1.05 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

2.01 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.

2.02 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.

2.03 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

2.04 FITTINGS

A. Use fittings of same size as pipe. Reducers are not permitted to facilitate an off-size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line and coat fittings as specified for pipe they 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.

2.05 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.

2.06 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

3.01 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.

3.02 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

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. Unit Prices.

1. No separate payment will be made for HDPE pipe under this Section. Include cost in unit prices for work, as specified in Division 31.
2. Refer to Division 1 for unit price procedures.

B. 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 Slip lining 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	F-714	DR 21	46	8" – 48" 3" – 12"

		NAPCO Ameriflow by KWH				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 augering of pipe.

D. Bedding and backfill: Conform to requirements of Division 31.

END OF SECTION 33 06 40.10

SECTION 33 06 40.11
REINFORCED CONCRETE PIPE

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Reinforced concrete pipe for storm sewers.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for reinforced concrete pipe under this Section. Include cost in unit price work as specified in the following Sections:

a. 33 41 00 – Storm Utility Drainage Piping

B. 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.

1.03 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.

1.04 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

2.01 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.

2.02 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

2.03 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

3.01 INSTALLATION

A. Conform to requirements of the following Sections, as applicable:

1. 33 41 00 - Storm Utility Drainage Piping

B. Install reinforced concrete pipe in accordance with manufacturer's recommendations.

END OF SECTION 33 06 40.11

SECTION 33 11 00
WATER UTILITY DISTRIBUTION PIPING

PART 1 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. Unit Prices.

1. Payment for water lines installed by open-cut, augered with or without casing, aerial crossing, and pipe offset section or within limits of Potentially Petroleum Contaminated Area (PPCA) is on linear foot basis for each size of pipe installed. Separate pay items are used for each type of installation.
   a. Mains: Measure along axis of pipe and include fittings and valves.
   b. Branch Pipe: Measure from axis of water line to end of branch.
2. Payment for interconnection is on lump sum basis for each interconnection identified on Drawings. Payment will include tapping sleeve and valves piping, connections and other related work necessary for construction as shown on Drawings or specified herein.
3. Payment for removal of existing internal elliptical or dished head plug is on unit price basis for each internal elliptical or dished head plug removed. Payment will include deletion of plug, drainage or dewatering of water lines, repair of damaged linings, rechlorination and items incidental to operation.
4. Payment for plug and clamp is on a unit price basis for each size of pipe.
5. Payment for drainline connection with service manhole is on unit price basis for each drainline shown on drawings. Payment includes valve, access manhole and connection.
6. Payment for cylindrical corrosion barriers is on a unit price basis for each pipe fitting installed with one or more barriers.
7. When directed by Owner’s Representative to install extra fittings as required to avoid unforeseen obstacles, payment will be based on the following:
   a. Each extra fitting requested by Owner’s Representative and delivered to jobsite will be paid according to unit price for "Extra Fittings in Place."
   b. Payment will include and be full compensation for items necessary for installation and operation of water line.
8. Refer to Division 1 for unit price procedures.

B. 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. Submit Lone Star notification transmittal number prior to beginning excavation.

D. 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. Prestressed Concrete Cylinder Pipe, Bar-Wrapped Pipe and Steel Pipe: Welded joints (see Paragraph 3.06 D).

D. Restrained Joints where required on DIP and PVC pipe:

1. Restraint devices: Manufacture of high strength ductile iron, ASTM A 536 up to 24 inches, and ASTM A 36 for sizes greater than 30 inches. Working pressure rating twice that of design test pressure.
2. Bolts and connecting hardware: High strength low alloy material in accordance with ANSI A21.11/AWWA C111.

2.4 COUPLINGS AND APPURTENANCES FOR LARGE DIAMETER WATERLINE

A. Flexible (Dresser-type) Couplings.

1. Install where shown on Drawings or where allowed by Owner's Representative for Contractor's convenience. Use galvanized flexible couplings when installed on galvanized pipe which is cement lined, or when underground. Provide gaskets manufactured from Neoprene or Buna-N.
2. For steel pipe; provide approved sleeve-type flexible couplings. Thickness of middle ring equal to or greater than thickness of pipe wall.
3. Provide approved flanged adapter couplings for steel pipe.
4. Use Type 316 stainless steel bolts, nuts and washers where flexible couplings are installed underground. Coat entire coupling with 20-mil of approved coal tar coating.

B. Flap Valves: Provide approved flap valves on discharge of manhole drainline as shown on Drawings.

1. Body and Flap: ASTM A 126-B cast iron.
2. Seats: ASTM B 21-CA482 or ASTM B 301-CA145 bronze.
3. Resilient Seat
4. Hinge Arms: ASTM B 584-CA865 high tensile bronze.
5. Hinge pins: ASTM B 98-CA655 silicon bronze.

PART 3 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 manufacture's representative when connecting or modifying existing prestressed or pretension concrete cylinder pipe.
11. Provide field surveyed (horizontal and vertical elevations) "as-builts" of new construction and existing underground utilities encountered. Submit in accordance with Division 1.
12. Prior to performing plant work to be done on weekend, provide list of sites and contact person with phone numbers to Owner's Representative by noon on Thursday of week. Contact person must be accessible during weekend, have Houston Metro Area phone number, and be authorized to make emergency decisions.
13. No night work or plant shut down will be scheduled to begin two working days before or after designated Holidays.

G. For tie-ins to existing water lines, provide necessary material on hand to facilitate connection prior to shutting down existing water line. Provide governing agency a minimum of two weeks notice prior to shutting down existing water line.

3.6 JOINTS AND JOINTING

A. Rubber Gasketed Bell-and-Spigot Joints for Concrete Cylinder Pipe, Bar Wrapped Pipe PVC, Steel, and DIP:

1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.
2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.
3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.
4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage and replace if necessary before remaking joint.
5. Where preventing movement of 16-inch diameter or greater pipe is necessary due to thrust, use restrained joints as shown on Drawings.
    a. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.
    b. Do not include passive resistance of soil in thrust restraint calculations.
6. Except for PVC pipe, provide means to prevent full engagement of spigot into bell as shown on Drawings. Means may consist of wedges or other types of stops as approved by Owner’s Representative.

B. Flanged Joints where required on Concrete Cylinder Pipe, Bar Wrapped Pipe, Ductile Iron Pipe, or Steel Pipe:

1. AWWA C 207. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Align bolt holes to straddle vertical, horizontal or north-south center line. Do not exceed 3/64 inch per foot inclination of flange face from true alignment.
2. Use full-face gaskets for flanged joints. Provide 1/8-inch-thick cloth inserted rubber gasket material. Cut gaskets at factory to proper dimensions.
3. Use galvanized or black nuts and bolts to match flange material. Use cadmium-plated steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Maintain at all times approximately same distance between two flanges at points around flanges. Tighten bolts alternately (180° apart) until all are evenly tight. Draw bolts tight to ensure proper seating of gaskets. Provide Densco petroleum based tape or approved equal for all exposed portions of nuts, bolts and pipe.
4. Full length bolt isolating sleeves and washers shall be used with flanged connections. Furnish kits in accordance with City of Houston's "Approved Products List."

5. For in-line flange joints 30 inches in diameter and greater and at butterfly valve flanges, provide Pyrox G-10 with nitrite seal, conforming to ANSI A 21.11 mechanical joint gaskets. For in-line flange joints sized between 12 inches in diameter and greater and 24 inches in diameter and smaller, provide Phenolic PSI with nitrite seal gasket conforming to ANSI A 21.11 mechanical joint gaskets.

C. Welded Joints (Concrete Cylinder Pipe, Bar Wrapped Pipe, Steel Pipe):

1. Prior to starting work, provide certification of qualification for welders employed on project for type of work procedures and positions involved.
2. Joints: AWWA C 206. Full-fillet, single lap-welded slip-type either inside or outside, or double butt-welded type; use automatic or hand welders; completely penetrate deposited metal with base metal; use filler metal compatible with base metal; keep inside of fittings and joints free from globules of weld metal which would restrict flow or become loose. Do not use mitered joints. For interior welded joints, complete backfilling before welding. For exterior field-welded joints, provide adequate working room under and beside pipe. Use exterior welds for 30-inch and smaller.
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. 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.
5. 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.
6. Welding rods: Compatible with metal to be welded to obtain strongest bond, E-70XX.
7. 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.
8. 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.
9. 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.

10. Make tack weld of same material and by same procedure as completed weld. Otherwise, remove tack welds during welding operation.
11. Remove dirt, scale, and other foreign matter from inside piping before tying in sections, fittings, or valves.
12. 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
13. 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.
14. 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.
15. Provide cylindrical corrosion barriers for epoxy lined steel pipe 24-inch diameter and smaller, unless minimum wall thickness is 0.5 inches or greater.

a. In addition to welding requirements contained here in Paragraph 3.06, conform to protection fitting manufacturer's installation recommendations.
b. Provide services of technical representative of manufacturer available on site at beginning of pipe laying operations. Representative to train welders and advise regarding installation and general construction methods. Welders must have 12 months prior experience installing protection fittings.
c. All steel pipe is to have cutback 3/4 inch to no greater than 1 inch of internal diameter coating from weld bevel.
d. Furnish steel fittings with cylindrical corrosion barriers with shop welded extensions to end of fittings. Extension length to measure no less than diameter of pipe. Shop apply lining in accordance with AWWA C 210 or AWWA C 213.
e. All steel pipe receiving field adjustments are to be cold cut using standard practices and equipment. No cutting using torch is to be allowed.

D. Harnessed Joints (Concrete Cylinder Pipe, Bar Wrapped Pipe):

1. Use of snap-ring type restrained joints on pipe is limited to 20-inch through 48-inch diameters.
2. Position snap-ring joint bolt on top (12 o'clock portion). Provide minimum 1/2-inch joint recess. Use joint "diapers" minimum of 12 inches wide.
3. For field adjustments with deflections beyond manufacturer's recommendations:
   a. Field trim spigot.
   b. Do not engage ring.
4. Harnessed joints are not permitted in areas defined on Drawings as potentially petroleum contaminated material, in tunnels, or at bend greater than 5 degrees.
5. Install harness type joints including snap rings at straight sections of pipe.

E. Restrained Joints

1. For existing water lines and water lines less than 16 inches in diameter, restrain pipe joints with concrete thrust blocks.
2. Thrust restraint lengths shown on Drawings are minimum anticipated lengths. These lengths are based on deflections indicated and on use of prestressed concrete cylinder pipe for large diameter lines and ductile iron pipe for small diameter lines. Adjustments in deflections or use of other pipe material may result in reduction or increase of thrust lengths. Perform calculations by pipe manufacturer to verify proposed thrust restraint lengths. Submit calculations for all pipe materials sealed by a registered Professional Engineer in State of Texas for review by Owner’s Representative. Make adjustments in thrust restraint lengths at no additional cost to Owner.
3. Passive resistance of soil will not be permitted in calculation of thrust restraint.

4. For 16-inch lines and larger use minimum 16-foot length of pipe in and out of joints made up of beveled pipe where restraint joint lengths are not identified on Drawings. Otherwise, provide restraint joints for a minimum length of 16 feet on each side of beveled joints.
5. Installation.
    a. Install restrained joints mechanism in accordance with manufacturer's recommendations.
    b. Examine and clean mechanism; remove dirt, debris and other foreign material.
    c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.
    d. Verify gasket is evenly seated.
    e. Do not over stab pipe into mechanism.
6. Prevent any lateral movement of thrust restraints throughout pressure testing and operation.
7. Place 2500 psi concrete conforming to Division 32, for blocking at each change in direction of existing water lines, to brace pipe against undisturbed trench walls. Finish placement of concrete blocking, made from Type I cement, 4 days prior to hydrostatic testing of pipeline. Test may be made 2 days after completion of blocking if Type II cement is used.

F. Joint Grout (Concrete Cylinder Pipe, Bar Wrapped Pipe, Steel Pipe):

1. Mix cement grout mixture by machine except when less than 1/2 cubic yard is required. When less than 1/2 cubic yard is required, grout may be hand mixed. Mix grout only in quantities for immediate use. Place grout within 20 minutes after mixing. Discard grout that has set. Retempering of grout by any means is not permitted.
2. Prepare grout in small batches to prevent stiffening before it is used. Do not use grout which has become so stiff that proper placement cannot be assured without retempering. Use grout for filling grooves of such consistency that it will adhere to ends of pipe.
3. Surface Preparation: Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces with wire brush or hammer to sound, clean surface. Remove rust and foreign materials from metal surfaces in contact with grout.
4. Follow established procedures for hot and cold weather concrete placement.
5. Complete joint grout operations and backfilling of pipe trenches as closely as practical to pipe laying operations. Allow grouted exterior joints to cure at least 1 hour before compacting backfill.
6. Grouting exterior joint space: Hold wrapper in place on both sides of joint with minimum 5/8-inch-wide steel straps or bands. Place no additional bedding or backfill material on either side of pipe until after grout band is filled and grout has mechanically stiffened. Pull ends of wrapper together at top of pipe to form access hole. Pour grout down one side of pipe until it rises on other side. Rod or puddle grout to ensure complete filling of joint recess. Agitate for 15 minutes to allow excess water to seep through joint band. When necessary, add

more grout to fill joint completely. Protect gap at top of joint band from backfill by allowing grout to stiffen or by covering with structurally protective material. Do not remove band from joint. Proceed with placement of additional bedding and backfill material.

7. Interior Joints for Pipe 24 inches and Smaller: Circumferentially butter bell with grout prior to insertion of spigot, strike off flush surplus grout inside pipe by pulling filled burlap bag or inflated ball through pipe with rope. After joint is engaged, finish off joint grout smooth and clean. Use swab approved by Owner's Representative for 20-inch pipe and smaller.
8. Protect exposed interior surfaces of steel joint bands by metallizing, by other approved coatings, or by pointing with grout. Joint pointing may be omitted on potable water pipelines if joint bands are protected by zinc metallizing or other approved protective coatings.
9. Remove and replace improperly cured or otherwise defective grout.
10. Strike off grout on interior joints and make smooth with inside diameter of pipe.
11. When installed in tunnel or encasement pipe and clearance within casing does not permit outside grout to be placed in normal manner, apply approved flexible sealer, such as Flex Protex or equal, to outside joint prior to joint engagement. Clean and prime surfaces receiving sealer in accordance with manufacturer's recommendations. Apply sufficient quantities of sealer to assure complete protection of steel in joint area. Fill interior of joint with grout in normal manner after joint closure.

12. Interior Joints for Water Lines 30 inches and Larger: Clean joint space, wet joint surfaces, fill with stiff grout and trowel smooth and flush with inside surfaces of pipe using steel trowel so that surface is smooth. Accomplish grouting at end of each work day. Obtain written acceptance from Owner's Representative of inside joints before proceeding with next day's pipe laying operation. During inspection, insure no delamination of joint mortar has occurred by striking joint mortar lining with rubber mallet. Remove and replace delaminated mortar lining.
13. Work which requires heavy equipment to be over water line must be completed before mortar is applied to interior joints.

G. Large Diameter Water Main Joint Testing: In addition to testing individual joints with feeler gauge approximately 1/2 inch wide and 0.015-inch thick, use other joint testing procedure approved or recommended by pipe manufacturer which will help ensure watertight installation prior to backfilling. Perform tests at no additional cost to Owner.

H. Make curves and bends by deflecting joints or other method as recommended by manufacturer and approved by Owner's Representative. Submit details of other methods of providing curves and bends which exceed manufacturer's recommended deflection prior to installation.

1. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer, unless otherwise indicated on Drawings.
2. If deflection exceeds that specified but is less than 5 percent, repair entire deflected pipe section such that maximum deflection allowed is not exceeded.
3. If deflection is equal to or exceeds 5 percent from that specified, remove entire portion of deflected pipe section and install new pipe.
4. Replace, repair, or reapply coatings and linings as required.
5. Assessment of deflection may be measured by Owner's Representative at location along pipe. Arithmetical averages of deflection or similar average measurement methods will not be deemed as meeting intent of standard.
6. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

I. Closures Sections and Approved Field Modifications to Steel, Concrete Cylinder Pipe, Bar Wrapped Pipe and Fittings:

1. Apply welded-wire fabric reinforcement to interior and exterior of exposed interior and exterior surfaces greater than 6 inches in diameter. Welded-wire fabric: minimum W1; maximum spacing 2 inches by 4 inches; 3/8 inch from surface of steel plate or middle third of lining or coating thickness for mortar thickness less than 3/4 inch.
2. Fill exposed interior and exterior surfaces with nonshrink grout.
3. For pipe diameters 36 inches and greater, perform field welds on interior and exterior of pipe.

4. For large diameter water lines, provide minimum overlap of 4 inches of butt strap over adjacent piece on butt-strap closures.

3.7 CATHODIC PROTECTION APPURTENANCES

A. Where identified on Drawings, modify pipe for cathodic protection as detailed on Drawings and specified. Unless otherwise noted, provide insulation kits including test stations at connections to existing water system or at locations to isolate one type of cathodic system from another type, between water line, access manhole piping and other major openings in water line, or as shown on Drawings.

B. Bond joints for pipe installed in tunnel or open cut, except where insulating flanges are provided. Weld strap or clip between bell and spigot of each joint or as shown on Drawings. No additional bonding required where joints are welded for thrust restraint. Repair 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 33 11 00

SECTION 33 12 13.12
WET CONNECTIONS

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Wet connections for new water mains and service lines to existing water mains.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for wet connections shown on Drawings is on the basis of each wet connection. Separate payment will be made for each size of water main.
2. No compensation will be given for extra work or for damages occurring as a result of an incomplete shutoff.

B. 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.

1.03 REFERENCES

A. AWWA C 800 - Underground Service Line Valves and Fittings.

1.04 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

2.01 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

3.01 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.

3.02 2-INCH WET CONNECTIONS

A. Tap water main. Use corporation cocks, saddles, copper tubing as required for line and grade adjustment, and brass fittings necessary to adapt to existing main. Use 2-inch valves when indicated on Drawings for 2-inch copper gooseneck connections.

END OF SECTION 33 12 13.12

SECTION 33 12 16
WATER UTILITY DISTRIBUTION VALVES

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Gate valves.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for gate valves 20 inches in diameter and smaller under this Section. Include payment in unit price for water lines.
2. Payment for gate valves 24 inches to 36 inches in diameter is on a unit price basis. Unit price includes cost of required box for gate valves.
3. Payment for 2-inch blow-off valve with box is on a unit price basis for each installation.
4. Refer to Division 1 for unit price procedures.

B. 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 bulkheaded and gate open. Valve shall show no leakage through metal, flanged joints, or stem seals. Test at rated working pressure, applied through bulkheads alternately to each side of closed gate with opposite side open for inspection. Valve shall show no leakage through metal, flanged joints, or stem-seals. Do not exceed leakage rate of 1 oz/hr/inch of nominal valve size.

D. Repair or replace valves which exceed leakage rate.

END OF SECTION 33 12 16

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. Unit Prices.

1. No separate payment will be made for valve boxes under this Section. Include payment in unit price for Division 1.
2. No separate payment will be made for meter boxes under this Section. Include payment in unit price for Division 1.
3. Payment for each size of meter vaults is on unit price basis per vault. Payment will be made for each vault installed, regardless of depth.
4. Refer to Division 1.

B. 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
2. 6-inch ductile-iron, thickness Class 51 riser pipes in accordance with Division 33.
3. Provide single section of pipe.

E. Concrete for valve box placement:

1. For locations in new concrete pavement, provide strength and mix design of new pavement.
2. For other locations, provide concrete for sidewalks conforming to requirements of Division 32.

2.2 METER BOXES

A. Provide meter boxes as required by the governing authority and as shown on the drawings.

2.3 CAST-IRON METER BOXES

A. Cast-Iron Boxes: Clean and free from sand blow-holes or other defects conforming to requirements of ASTM A 48, Class 30B. Bearing surfaces shall be machined so that covers seat evenly in frames.

B. Boxes and lids shall have dipped, coal-tar-pitch, varnish finish.

C. Provide lock-type meter boxes when required by Drawings. Lock mechanisms shall work with ease.

2.4 CONCRETE METER BOXES

A. Concrete Meter Boxes: Made of Class A concrete, with minimum 4000 psi compressive strength, conforming to requirements of Division 32. Construct to dimensions shown on Drawings.

B. Castings: Free from fractures, large or deep cracks, blisters or surface roughness or any other defects that may affect serviceability.

2.5 PLASTIC METER BOXES

A. Plastic Meter Boxes: Made of high density polyethylene conforming to the following ASTM standards:

ASTM	REQUIREMENT
D 256	Impact Strength = 1/9 ft.-lb./inch (Izod, Notched)
D 256	Impact Strength – 6.4 ft.-lb./inch (Izod, Un-Notched)
D 638	Tensile Strength (2.0 min.) = 3400 psi
D 648	Deflection Temperature = 170 degrees F
D 2240	Shore D, Hardness, 55-65 Impact Strength, Falling Dart Method, 160 inch-lb.
D 790	Flexural Modulus = 90,000 psi

B. Meter boxes shall meet the following test requirements:

1. Static Load: Not less than 2500 pounds using 6-inch disc with direct compression exerted at center of top of meter box with solid plastic lid.

2. Deflection: Not less than 1000 pounds load required to deflect top edge of meter box 1/8- inch.
3. Meter box body, without lid, shall weigh approximately 7 pounds.

2.6 METER VAULTS

A. Meter vaults may be constructed of precast concrete, cast-in-place concrete, or common brick masonry unless a specific type of construction is required by Drawings.

B. Concrete for Meter Vaults: Class A concrete, conforming to requirements of Division 32 with minimum compressive strength of 4000 psi at 28 days.

C. Reinforcing steel for meter vaults: Conform to requirements of Division 32.

D. Grates and Covers: Conform to requirements of Division 33.

PART 3 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 3-inch-thick bed of sand conforming to requirements of Division 31.
2. Seal lifting holes with cement-sand mortar or non-shrink grout.

C. Meter Vault Floor Slab:

1. Construct floor slabs of 6-inch-thick reinforced concrete. Slope floor 1/4 inch per foot toward sump. Make sump 12 inches in diameter, or 12 inches square, and 4 inches deep, unless other dimensions are required by Drawings. Install dowels at maximum of 18 inches, center-to-center for keying walls to floor slab.

2. Precast floor slab elements may be used for precast vault construction.

D. Cast-in-Place Meter Vault Walls:

1. Key walls to floor slab and form to dimensions shown on Drawings. Minimum wall thickness shall be 4 inches.
2. Cast walls monolithically. One cold joint will be allowed when vault depth exceeds 12 feet.
3. Set frame for cover in concrete.

3.5 FRAME AND COVER FOR METER VAULTS

A. Set cast iron frame in a mortar bed and adjust elevation of cover as follows:

1. In unpaved areas, set top of meter box or meter vault cover 2 to 3 inches above natural grade.
2. In paved areas, set top of meter box or meter vault cover flush with adjacent concrete but no higher than 1/2-inch.

3.6 BACKFILL

A. Provide bank run sand in accordance with Division 31 and backfill and compact in accordance with Division 31.

B. In unpaved areas, slope backfill around meter boxes and vaults to provide a uniform slope 1-to-5 slope from top to natural grade.

C. In paved areas, slope concrete down from meter box or vault to meet adjacent paved area.

END OF SECTION 33 12 40

SECTION 33 13 00
DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 G E N E R A L

1.1 SECTION INCLUDES

A. Disinfection of potable water lines.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for disinfection of water lines under this Section. Include cost in unit price of water lines being disinfected.
2. Refer to Division 1 for unit price procedures.

B. Adjusting Payment for Retesting.

1. Subsequent disinfection operations which may be necessary due to nonconforming or incomplete construction will be charged to Contractor. Charges will be deducted from retainage amounts when construction estimates are processed for final payment.
2. Total charge will consist of base charge of $135.00 plus footage charge based on number of feet of specified diameter pipe in construction project. Footage charge is as follows:

Size of Pipe	Charge per Linear Foot
2 inch to 4 inch	$0.03
6 inch	$0.04
8 inch	$0.05
10 inch to 12 inch	$0.07
16 inch to 20 inch	$0.09
24 inch to 30 inch	$0.13
32 inch to 48 inch	$0.16
54 inch	$0.20
60 inch	$0.22
66 inch	$0.31
72 inch to 84 inch	$0.40
90 inch to 96 inch	$0.58
108 inch	$0.75
120 inch or larger	$1.00

C. 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. After disinfection and flushing of water lines, bacteriological tests will be performed by the governing agency or testing laboratory in accordance with Division 1. When test results indicate need for additional disinfection of water lines based upon Texas Department of Health requirements, assist Contractor shall provide additional disinfection operations at no additional cost to the Owner.

3.5 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 33 13 00

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. Unit Prices.
   1. No payment will be made for hydrostatic testing of pipelines under this Section. Include cost in unit price of pipelines being tested.
   2. Refer to Division 1 for unit price procedures.

B. 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. Begin test by 9:00 a.m. unless otherwise approved by Owner's Representative. Maintain test pressure for 8 hours. When large quantity of water is required to maintain pressure during test, discontinue testing until cause of water loss is identified and corrected.

E. Keep valves inside pressure reducing stations closed during hydrostatic pressure test.

3.3 ALLOWABLE LEAKAGE FOR WATERLINES

A. During hydrostatic tests, no leakage will be allowed for sections of water lines consisting of welded joints.

B. Maximum allowable leakage for water lines with rubber gasketed joints: 3.19 gallons per inch nominal diameter per mile of pipe per 24 hours while testing.

C. For meter run installation, when work cannot be isolated and line fails pressure test, visual inspection of work by Owner's Representative for leakage during pressure test may be used to fulfill requirements of this section.

3.4 CORRECTION FOR FAILED TESTS

A. Repair joints showing visible leaks on surface regardless of total leakage shown on test. Check valves and fittings to ensure that no leakage occurs that could affect or invalidate test. Remove cracked or defective pipes, fittings, and valves discovered during pressure test and replace with new items.

B. Owner's Representative may require failed lines to be disinfected after repair and prior to retesting. Conduct and pay for subsequent disinfection operations in accordance with requirements of Division 33. Pay for water required for additional disinfection and retesting.

C. Repeat test until satisfactory results are obtained.

3.5 COMPLETION

A. Upon satisfactory completion of testing, remove risers remaining from disinfection and hydrostatic testing, and backfill excavation promptly.

SECTION 33 31 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. Unit Prices

1. Payment for gravity sanitary sewers by open-cut or within Potentially Petroleum Contaminated Area (PPCA) is on linear foot basis, complete in place, including sewer pipe, connections to existing manholes, post installation television inspection and testing. Measurement will be taken along centerline of pipe from centerline to centerline of manholes.
2. Payment for television inspection of existing gravity sanitary sewer will be on a linear foot basis. Measurement will be taken along centerline of pipe from centerline to centerline of manholes. See Division 1.
3. Refer to Division 1 for unit price procedures.

B. 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 pipes are 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 microtunneling work as appropriate.

3.6 INSTALLATION OF APPURTENANCES

A. Service Connections. Install service connections to conform to requirements of Division 33.

B. Stacks. Construct stacks to conform to requirements of Division 33.

C. Construct manholes to conform to requirements of Division 33 as applicable. Install frames, rings, and covers to conform to requirements of Division 33.

3.7 INSPECTION AND TESTING

A. Visual Inspection: Check pipe alignment in accordance with Division 33.

B. Mandrel Testing. Use Mandrel Test to test flexible pipe for deflection. Refer to Division 33.

C. Pipe Leakage Test. After backfilling line segment and prior to tie-in of service connections, visually inspect gravity sanitary sewers where feasible, and test for leakage in accordance with Division 33. Maintain piezometer installed to conform with Division 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 video 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. Produce video 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 on CD in a format compatible with Windows Media Player. Two labels are required. Place one label on the case and the other on the face of each CD. Permanently label each video tape with the 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.

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. Unit Prices.

1. No payment will be made for acceptance testing under this Section. Include payment in unit price for work requiring acceptance testing.
2. Refer to Division 1 for unit price procedures.

B. 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 sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.
   d. Pressurize pipe to 4.0 psig. Increase pressure 1.0 psi for each 2.3 feet of ground water over highest point in system. Allow pressure to stabilize for 2 to 4 minutes. Adjust pressure to start at 3.5 psig (plus adjustment for ground water table). See Table 33 31 00.10-2 at end of this Section.
   e. To determine air loss, measure time interval for pressure to drop to 2.5 psig. Time must exceed that listed in Table 33 31 00.10-2 at end of this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.

F. Retest: Repair and retest any section of pipe which fails to meet requirements.

3.5 TEST CRITERIA TABLES

A. Exfiltration and Infiltration Water Tests: Refer to Table 33 31 00.10-1, Water Test Allowable Leakage, at end of this Section.

B. Low Pressure Air Test:

1. Times in Table 33 31 00.10-2, Time Allowed For Pressure Loss From 3.5 psig to 2.5 psig, at end of this Section, are based on equation from Texas Natural Resources and Conservation Commission (TNRCC) Design Criteria 317.2(a)(4)(B).

		$T = 0.0850(D)(K)/(Q)$
Where:	T =	Time for pressure to drop 1.0 pounds per square inch gauge in seconds
	K =	0.000419 DL, but not less than 1.0
	D =	Average inside diameter in inches
	L =	Length of line of same pipe size in feet
	Q =	Rate of loss, 0.0015 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.

Notes:
1. When two sizes of pipe are involved, compute time by ratio of lengths involved.

2. Lines with 27-inch average inside diameter and larger may be air tested at each joint.
3. Lines with average inside diameter greater than 36 inches must be air tested for leakage at each joint.
4. If joint test is used, perform visual inspection of joint immediately after testing.
5. For joint test, pipe is to be pressurized to 3.5 psi greater than pressure exerted by groundwater above pipe. Once pressure has stabilized, minimum times allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

3.6 LEAKAGE TESTING FOR MANHOLES

A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.

B. Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged when lines entering manhole have not been backfilled.

C. Vacuum testing:

1. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.
2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for time period specified in Table 33 31 00.10-4, Vacuum Test Time Table.
3. If drop in vacuum exceeds 1 inch Hg over specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

D. Perform hydrostatic exfiltration testing as follows:

1. Seal wastewater lines coming into manhole with internal pipe plug. Then fill manhole with water and maintain it full for at least one hour.
2. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

3.7 SMOKE TEST PROCEDURE FOR POINT REPAIRS

A. Application: Perform smoke test to:

1. Locate points of line failure for point repair.
2. Determine when point repairs are properly made.
3. Determine when service connections have been reconnected to rehabilitated sewer.
4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.

B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in single manhole section at one time. Keep number of open excavations to minimum.

C. Preparation: Prior to smoke testing, give written notices to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to Police and Fire Departments 24 hours prior to actual smoke testing.

D. Isolate Section: Isolate manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal annular space at manhole for sliplined sections.

E. Smoke Introduction:

1. Operate equipment according to manufacturer's recommendation and as approved by Owner’s Representative.
2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for minimum of 5 minutes.
3. Introduce smoke into upstream and downstream manhole as appropriate. Monitor tap/connection for smoke leaks. Note sources of leaks.

F. Repair and Retest: Repair and replace taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at time. When repair or replacement, testing or retesting, and backfilling of excavation is not completed within one work day, properly barricade and cover each excavation as approved by Owner’s Representative.

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	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of diameters by value for 1" diameter.			Equivalent to 50 gallons per inch of inside diameter per mile per 24 hours.	

* Allowable leakage rate shall be reduced to 10 gallons per inch of inside diameter per mile per 24 hours, when 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	0.854	5:4	5:4	5:4	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	8	0	0	0	7:33	7:36	8:52	10:0	11:2	12:4	13:5	15:1
10	9:27	239	1.519	7:3	7:3	7:3	9:54	11:5	13:5	8	4	0	6	2
12	11:20	199	6	3	3	3	14:1	2	1	15:5	17:4	19:4	21:4	23:4
15	14:10	159	2.374	9:2	9:2	9:2	5	17:0	19:5	0	8	7	6	5
18	17:00	133	3	7	7	7	22:1	6	7	22:4	25:3	28:3	31:2	34:1
21	19:50	114	3.419	11:	11:	11:	6	26:4	31:1	8	9	0	0	1
24	22:40	99	0	20	20	20	32:0	3	0	35:3	40:0	44:3	48:5	53:2
27	25:30	88	5.342	14:	14:	17:	3	38:2	44:5	7	4	1	8	5
30	28:20	80	3	10	10	48	43:3	8	2	51:1	57:4	64:0	70:3	76:5
33	31:10	72	7.692	17:	19:	25:	8	52:2	61:0	7	2	6	1	6

			8 10.47 08 13.67 62 17.30 89 21.36 90 25.85 65	00 19: 50 22: 48 28: 51 35: 37 43: 06	14 26: 11 34: 11 43: 16 53: 25 64. 38	39 35: 54 45: 35 57: 42 71: 14 86: 11	56:5 9 72:0 7 89:0 2 107: 44	1 68:2 3 86:3 3 106: 51 129: 17	5 79:4 7 100: 58 124: 39 150: 50	69:4 8 91:1 0 115: 24 142: 28 172: 23	78:3 2 102: 34 129: 49 160: 16 193: 55	87:1 5 113: 58 144: 14 178: 05 215: 28	95:5 9 125: 22 158: 40 195: 53 237: 01	104: 42 136: 46 173: 05 213: 41 258: 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 33 31 00.10

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. Unit Prices

1. Payment for storm sewers, including elliptical or box, installed by open-cut, augered with or without casing, or tunneling is on linear foot basis. Measurement for storm sewers and roadside ditch culverts will be taken along center line of pipe from center line to center line of manholes or from end to end of culverts. Payment will be made for each linear foot installed complete in place, including connections to existing manholes and inlets.
2. Payment for storm sewer leads, including elliptical leads, is on a linear foot basis.
3. Payment for corrugated metal pipe storm sewer outfall, including timber bents, is on a linear foot basis.
4. Refer to Division 1 for unit price procedures.

B. 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 33 41 00

SECTION 33 49 13
STORM DRAINAGE MANHOLES, FRAMES AND COVERS

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. Unit Prices

1. No payment will be made for frames, grates, rings, covers, and seals under this Section. Include payment in unit price for related item.
2. Payment to rack over existing manhole is on a unit price basis for each manhole.
3. Refer to Division 1 for unit price procedures.

B. 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 33 49 13